S·A·E Journal

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John A. C. Warner, Secretary and General Manager

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About Authors

■ W. H. BROWNE *is digging for solutions to fuel problems specifically related to fuel-ignition-quality rating, cold starting, and combustion-chamber design as laboratory engineer in the research laboratory of the Caterpillar Tractor Co., with which he has been associated since 1936. In that year he received his M.E. degree from Rensselaer Polytechnic Institute.*

■ B. A. D'ALLEVA *and* P. K. WINTER *joined the team of* JOHN M. CAMPBELL *(M '37) and* WHEELER G. LOVELL *(M '37) in getting facts together for their SAE Annual Meeting paper, "A Thirteen-Year Improvement in Mixture Ratios." The two new collaborators, joining the pair of General Motors Research Laboratories authors which has presented a number of papers before the Society, are also on the Laboratories' staff.*

Mr. D'Alleva specializes on problems dealing with fuels for internal-combustion engines. In addition to his work on the composition of gasoline-engine exhaust gas, he is interested in fuel combustion and detonation phenomena in both gasoline and diesel engines. He joined the Research Laboratories in 1930, after receiving his B.S degree from the University of Michigan. He majored in chemical engineering.

Mr. Winter is research chemist in the organic chemistry department and is interested primarily in analytical problems, especially the interpretation of analytical data on engine exhaust gas. He received his Ph.D. degree in analytical chemistry from Ohio State University after holding an Assistantship in the University's Department of Chemistry for four years. Then followed two years on the campus as Research Assistant on an industrial project, before joining the GM Research Laboratories in 1937.

As assistant head of the GM Laboratories' organic chemistry department, Mr. Lovell has done a great deal of

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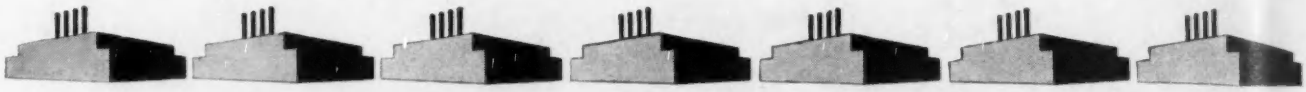

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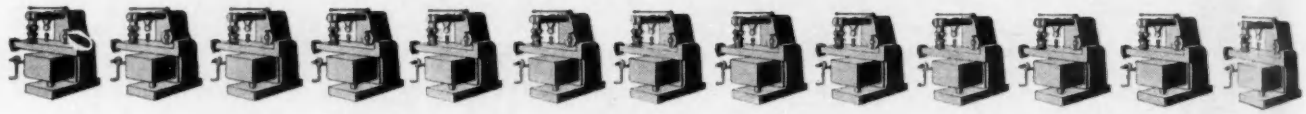

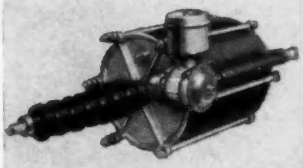

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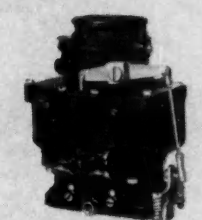

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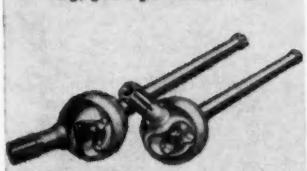

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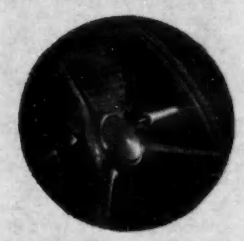

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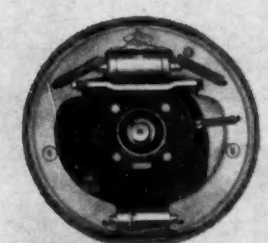

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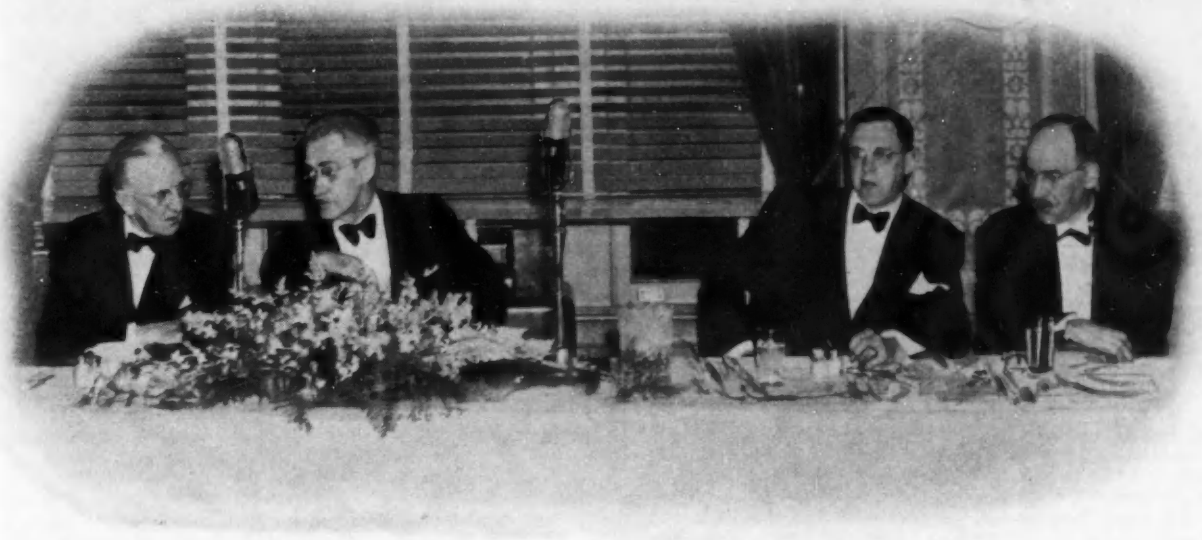


SPEAKERS at Aero Banquet – (left to right) C. C. Carlton, managing director, Automotive Committee for Air Defense, principal speaker; W. B. Stout, toastmaster; SAE President A. T. Colwell; and G. E. Reynolds, chairman, Washington Section

Civil and Military Technical Gains Flashed at Aero Meeting

IMPRESSIVE developments reported at the two-day SAE National Aeronautic Meeting, Hotel Washington, Washington, D. C., March 13 and 14, give evidence of long-sustained "all-out" effort of aeronautic engineers. A record attendance of over 400 and spirited discussion that carried each of the five technical sessions over its scheduled closing time further reflected their intensified activity.

The military aircraft defense program shared the spotlight with the still-growing civil aircraft industry in the eleven technical papers presented at the meeting; in fact, most of the developments discussed could be applied to either type of aircraft. For example, improvements in fuel consumption – whether obtained through improved design of airscoops, "compounded" engines, or reduced drag through submerging the engines in the wings – can be used either to increase the lethal payload of a bomber to or decrease the operating cost of transport planes. An able clarification of current misconceptions as to mass production of aircraft engines was also presented at the Aircraft-Engine Sessions. Increased safety in civil aviation and pilot training was emphasized in papers on "easy-to-fly" private planes, problems in light aircraft engines, and icing problems of transport aircraft. Means of lowering propeller vibration and future trends in propeller diameters and number of blades were appraised critically in a brilliant three-paper propeller symposium.

"Before the end of the year the automotive industry will have 350,000 men working on defense production," predicted C. C. Carlton, managing director, Automotive Committee for Air Defense, delivering the principal speech at the Banquet which climaxed the meeting.

"Right now," he reported, "the industry is shipping 13,000 military vehicles a month to the Army."

Some idea of the immensity of the task shouldered by the automotive industry was obtained from Mr. Carlton's report of the Automotive Committee for Air Defense surveying the defense program: "The first section of the huge new Ford plant in which Consolidated bombers will be built near Ypsilanti, Mich., will be 800 ft wide and 300 ft deep; behind this will be another section 1200 ft long and 400 ft wide and, if the Government decides to assemble complete planes in this plant, the building will be extended to house an assembly line 1¼ miles long. . . . The far-flung defense assignments of General Motors already total $683,000,000. . . . 700,000 sq ft of new buildings for Chrysler's great tank arsenal are now under roof and machinery is being installed. When you remember that it requires 1000 man-hours to build the transmission alone for a 25-ton tank, you realize the immensity of Chrysler's tank job. . . . Goodyear will be employing 8000 men on aircraft production work by the end of this year, utilizing 1,000,000 sq ft of floor space. . . . $15,000,000 in Government defense orders will be in production at Hudson before the end of 1941."

RESULTS of intensified efforts of aeronautic engineers described in this report give reassuring evidence that American aircraft will more than hold their own in the accelerating struggle for world supremacy in the air.

Virtually every one of the striking developments reported at this meeting can be applied with equal effectiveness to the improvement of either military or civil aircraft.

Mr. Carlton's speech was preceded by a brief talk by SAE President A. T. Colwell. Reporting on the SAE Aircraft Standardization Program that is going ahead under the chairmanship of Arthur Nutt, he pointed out how standardization problems are changing as the country shifts from small to mass production of aircraft. He declared that Germany is the only country other than the United States that has progressed so far in standardization. But the Germans have overdone it, he added, freezing several models too rigidly.

Referring to talk about standardizing on models of American military planes, he asserted that "when and if this happens, the OPM will say which ones will be standardized when the models have had a chance to prove their worth."

Mr. Colwell was introduced by the Banquet's Toastmaster, W. B. Stout. G. E. Reynolds, chairman of the Washington Section, served as host for his Section and welcomed the meeting to Washington.

AIRCRAFT-ENGINE SESSIONS

Chairmen

R. N. DuBois **C. F. Bachle**

Can an improvement in fuel consumption be expected from compounded aircraft engines? Are flight tests essential in the development of satisfactory carburetor airscoops? Just what happens in the engine cylinder during detonation? Should design changes on military planes increase or decrease during the present emergency? Can

light aircraft engines that are submerged within the wings be cooled satisfactorily?

These and other questions, raised by the five papers presented, were subjects of spirited debate at the two Aircraft-Engine Sessions.

***Compounding – Facts and Fallacies* – FORD L. PRESCOTT, Senior Mechanical Engineer (Research), Power Plant Laboratory, Materiel Division, U. S. Air Corps.**

THE 2-cyl "compound" engine on which the data reported in his paper were obtained, Mr. Prescott explained, is provided with a high-pressure cylinder, and a low-pressure cylinder which serves as a compressor as well as a working cylinder. In a review of the history of this type of engine and the results of previous high-output tests, he pointed out that most of the proposed internal-combustion compound engines utilize the low-pressure piston only for expansion.

The primary consideration in this work, he said, was the extracting of additional work from the already partially expanded gases from the high-pressure cylinder; a secondary consideration was the use of the same low-pressure cylinder as a second-stage compressor to aid in supercharging the high-pressure cylinder.

In reporting test results covering the development and testing program on the 2-cyl test unit, Mr. Prescott displayed indicator diagrams showing the power developed in both high-pressure and low-pressure cylinders. The method of summarizing the test results, he declared, is by tabulating the representative runs and plotting the final runs. Some results and conclusions follow:

1. An indicated mep of 705 lb per sq in. was recorded in the high-pressure cylinder, but the corresponding imep in the low-pressure cylinder was only 63 lb per sq in.
2. Fuels are available which make possible mean effective pressures in the high-pressure cylinder heretofore considered fantastic, resulting in release pressures to the low-pressure cylinder of 350 to 400 lb per sq in.
3. Two-stage expansion to a final ratio of 15:1 or more is feasible.
4. The pressure and energy drop through the high-pressure exhaust valve is not serious, and modern internally cooled valves are satisfactory even under the unusual temperatures and pressure conditions encountered by this valve.
5. Compounding the expansion results in a definite increase in thermal efficiency.

Although the results of the test are not as good as desired, Mr. Prescott concluded, it is considered that the project is worthy of further development and research.

Discussion

Chairman DuBois led off discussion, priming a steady flow of queries directed at the author. He asked what improvement in indicated specific fuel consumtpion was possible with a two-stage engine. "We got one reading of 0.304 and two readings of about 0.25 lb per ihp-hr," Mr. Prescott replied. He explained that, because they were suspicious of the last two readings, they checked them carefully but could find nothing wrong.

Replying to Prof. H. C. Lichty, Yale University, who inquired about the comparative weight of compounded and conventional engines, Mr. Prescott pointed out that, if a compounded engine can effect a 20 to 30% improvement in specific fuel consumption, any increase in engine weight would not be significant as this increase would be small when compared with the weight saving in fuel load.

In response to a question on heat losses by F. C. Mock, Bendix Products Division, Bendix Aviation Corp., Mr. Prescott displayed a slide showing an indicator card of the low-pressure cylinder. Pointing to the difference between the theoretical and actual expansion lines, he showed that there is little heat loss if the difference in pressure on the indicator card is taken as the heat loss. Having the exhaust gas expand in the low-pressure cylinder immediately after leaving the high-pressure cylinder, he explained, leaves little time for radiation loss.

Carlton Kemper, National Advisory Committee for Aeronautics, was next called upon. He commended the Army for its foresight in continuing this important research on the two-stage engine in spite of pressure for defense production.

To questions by Arthur Nutt, Wright Aeronautical Corp., who wondered how the engine held up mechanically, especially under the extremely high pressures, Mr. Prescott declared that there were no indications of mechanical trouble – no valves burned out, no broken connecting rods, pistons, or piston rings. "Because nothing broke," he added, "we were afraid that we had made it too heavy. On the other hand, if something does break, we worry because we have made a mistake. We're wrong either way."

The piston speed employed in the tests was low – 2000 rpm and 5-in. stroke – he told A. T. Gregory, Ranger Aircraft Engines, giving as his reason the high pumping loss in the high-pressure cylinder at higher speeds. "We should like to have worked at a piston speed between 2500 and 3000 fpm," he declared.

Asked by F. L. Yerzly, E. I. du Pont de Nemours & Co., to give the equivalent in octane numbers, if possible, for the fuels used, Mr. Prescott replied that they were equivalent approximately to a range between octane plus 0.8 cc of tetraethyl lead and octane plus 2.5 cc of tetraethyl lead. "However," he emphasized, "the ability of a fuel to perform without detonation is out of all proportion to the octane scale after 100 octane number is exceeded."

J. H. Geisse, Civil Aeronautics Administration, inquired whether a turbine had been considered as the second stage of the compound engine. Mr. Prescott replied that it had, and that the turbine was believed logical for use either as the second stage or the third stage. The spark plugs of the compound engine were no limitation, he informed Earl S. Twining, Champion Spark Plug Co., explaining that ceramic plugs of the type used in racing automobiles were employed.

"We are not surprised at the performance obtained from the hollow-head valves," contributed SAE President A. T. Colwell, Thompson Products, Inc. He then asked Mr. Prescott whether he feels disappointed at the specific fuel consumption obtained of 0.5 lb per bhp-hr. Mr. Prescott replied that he was disappointed – that 0.3 lb per bhp-hr had been hoped for originally.

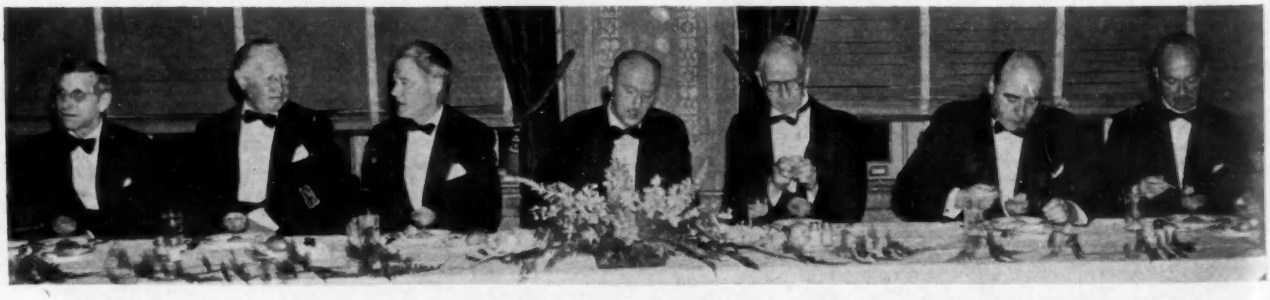
Others participating in the discussion were H. K. Cummings and Dr. H. C. Dickinson, National Bureau of Standards; R. S. Buck, Pratt & Whitney Aircraft; John G. Lee, United Aircraft Corp.; and G. D. McCormick, National Carbon Co.

***Design of Airscoops for Aircraft Carburetors* – M. J. KITTLER, chief engineer, Aircraft Division, Holley Carburetor Co.**

INCREASING use of fully automatic carburetors in aircraft, Mr. Kittler explained, has stressed the necessity for care in working out all elements of the installation so as to insure accurate metering of the carburetor under all operating conditions. Experimental flight investigations have demonstrated, he reported, that this statement is particularly true of the carburetor airscoop which admits the air to the carburetor and can therefore cause flow disturbances which may seriously affect carburetor metering.

Test laboratory investigations made on a number of airscoops to determine the factors contributing to the proper or improper functioning of the scoop, Mr. Kittler reported, revealed that the size and shape of

Distinguished Guests at Banquet Speakers' Table



Left to right: Hon. Harllee Branch, chairman, Civil Aeronautics Board; Dr. George W. Lewis, SAE vice president for Aircraft-Engine Engineering and director of aeronautical research, National Advisory Committee for Aeronautics; John D. Biggers, Office of Production Management; Com. A. M. Pride, member, Permanent Working Committee, The Aeronautical Board; Dr. Lyman J. Briggs, director, National Bureau of Standards; Dr. R. E. Wilson, Advisory Commission to the Council of National Defense; and Capt. L. T. Chalker, assistant chief operations officer, U. S. Coast Guard

scoop passages, and also the location of the hot air valves, were important factors. He went on to discuss general design criteria, ram characteristics under various conditions of flight and for various sizes of scoop, and the aerodynamic and structural characteristics of an actual production model of airscoop designed to include these various features.

In his conclusion, Mr. Kittler laid down five simple rules to assist the designer in laying out an airscoop which will incorporate the design features found to be desirable:

1. Provide the maximum length of straight section of scoop immediately ahead of the carburetor.
2. Use a sharp right-angle elbow – not a smooth turn.
3. Maintain a high aspect ratio in the scoop passages and elbow, in so far as possible.
4. Keep the heater valve as far away from the carburetor as possible and locate it on the far side of the scoop elbow.
5. Maintain at least 75% of the area of the carburetor entrance throughout the scoop and also at the heater valve. Avoid rapidly diverging sections, particularly just ahead of the carburetor entrance.

Discussion

In prepared discussion of Mr. Kittler's paper, F. C. Mock, Bendix Products Division, Bendix Aviation Corp., took exception to the author's emphasis on shapes. "Instead," he declared, "we should talk about air streams. In the past few weeks," he reported, "we have found the 'nigger in the wood pile' in the scoop business – and he is three times as big as he previously was thought to be."

In his company's experience, he continued, the chief difficulty with airscoops has been that they behaved differently in flight than in ground laboratory and engine dynamometer tests, the discrepancy being confined chiefly to maximum power at altitude, under which condition the mixture ratio tended to go rich. Recent tests reported in detail by Mr. Mock established that this change from ground calibration was due to a change in the nature and path of the air flow through the scoop and carburetor, this change being induced by turbulence from the propeller slipstream. Airscoops not in the path of the propeller blast did not have this disturbance, he said.

He pointed out that airscoops are usually designed for about 100 mph air speed at the entrance to the carburetor. When this disturbance occurred, he reported, the air flow into the scoop became discontinuous and, instead of filling the air passage, became a narrow "squirt" or jet of air at the slipstream velocity of the order of 275 mph or higher, usually down the back wall of the airscoop and carburetor. This condition, he declared, naturally disturbed the carburetor metering.

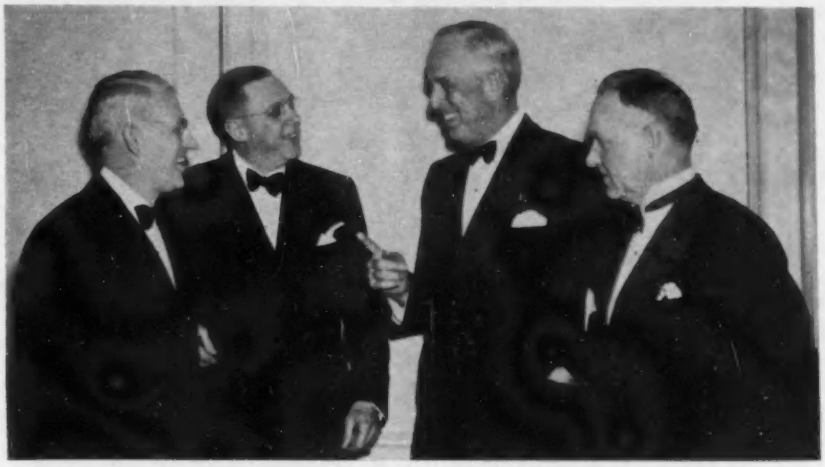
Present procurement procedure, Mr. Mock continued, assumes that the action of a carburetor and scoop is the same on ground engine test, with undisturbed air, as in flight. He contended that considerable controversy and waste of test time and effort have resulted from this misconception.

As a procedure for the future, Mr. Mock suggested:

1. That the airplane designer be made responsible for the selection of *location of the scoop entrance* at a point where it will receive uniform pressure over its area at all slip attitudes, altitudes, and other variable conditions of flight; and also for delivery of air at uniform pressure across the entrance face of the scoop elbow;
2. That the scoop designer then be responsible for transmitting this airflow to a uniform pressure across the carburetor entrance face *in flight*.
3. That the carburetor designer be responsible for accurate charge metering under this condition *in flight;*
4. And that the procurement plan be amended to provide proper compensation for the flight testing which this program involves.

In reply, Mr. Kittler expressed his agreement with Mr. Mock's comments about flight tests and budgeting. Pointing out the prohibitive cost of such tests to many manufacturers, he asserted that the question is: "Who is going to pay for them?" However, he added, it is worth a lot of effort to make the laboratory tests good enough to be able to say: "This will work in flight." "As carburetor manufacturers," he explained, "we must measure carburetor performance with the tools that we have." He also agreed that the scoop entrance should not be too close to the propeller – and that its location should be the airplane designer's job. He took issue with the British practice of modifying their carburetors to fit their air scoops, contending that they were doing two things wrong to try to make one thing right.

SAE Officers Consult With Government Air Chiefs



From left to right: SAE Past-President Arthur Nutt; SAE President A. T. Colwell; Merrill C. Meigs, chief, Aircraft Section, Engineering Unit, Office of Production Management; and Rear-Admiral John H. Towers, chief, Bureau of Aeronautics, Navy Department

The Present Status of Combustion Research **– ERNEST F. FIOCK, National Bureau of Standards.**

"ALTHOUGH the improvements that have been made in the combustion process as a source of power in engines are so great

(*Continued on page 25*)

More Distinguished Banquet Guests

Left to right: Hon. F. W. Reichelderfer, chief, U. S. Weather Bureau; F. H. Russell, president, Manufacturers Aircraft Association, Inc.; Dr. H. C. Dickinson, past president SAE and chairman, Heat & Power Division, National Bureau of Standards; T. P. Wright, assistant chief, Aircraft Section, Engineering Unit, Office of Production Management; Major D. G. Lingle, member, Permanent Working Committee, The Aeronautical Board; and John A. C. Warner, SAE secretary and general manager

Simi Gives Reasons Behind Motorcoach Design Trends

■ Milwaukee

Covering practically every phase of motorcoach design, H. E. Simi, chief engineer of the Twin Coach Co. and a former vice president of the Society, explained recent trends in his talk before the Milwaukee Section, Feb. 14.

The diesel-electric type of drive came in for considerable discussion. Mr. Simi stated that the conventional gear-type transmission has not been found satisfactory for use with the diesel because of lack of flexibility in the engine and that fluid couplings and hydraulically-operated gear drives do not measure up to the electric drive. However, he added, experiments are being continued in each of these fields.

Relative to the economic advantages of the diesel bus, Mr. Simi said that operating costs are about half of those of a gasoline-powered unit. On the other hand, he observed, diesel maintenance costs are perhaps 20% greater and the diesel engine's first cost is higher than that of the gasoline engine.

To overcome starting difficulties in cold weather, Mr. Simi said, installations have been made on some diesel-electric buses whereby the generator is used as a starting motor.

The Twin Coach Co., he said, is considering putting a safety shut-off in the air inlet in order to prevent "runaway" engines. He warned operators not to spray gum remover into a diesel engine because it will use this oil as fuel and run wild.

Strides in body design were illustrated by a number of slides he had shown depicting the transition of motorcoaches from the old box-like structure to the modern design with rounded corners and a vee front end. In the construction of many present-day buses, he pointed out, a continuous band extends around the bus above the doors which gives the body considerably more strength than in older construction where the band was broken up into panels. Body materials used in motorcoach construction were also covered by Mr. Simi.

The real "twin" of the Twin Coach company – the Super-Twin – which carries streetcar capacity loads, was described in detail by Mr. Simi. Forty-seven feet long, this bus is made up of two units coupled with a horizontal hinge that permits up-and-down movement between the sections. The center of the bus's three axles, which is located under the middle of the bus, is the driving unit. Both front and rear axles participate in the steering, permitting the vehicle to turn in approximately the same radius as a conventional 35-passenger bus, he explained. Mr. Simi commented particularly on the torque-rod type suspension spring with which the Super-Twin is equipped. This type of suspension, he said, is characterized by the variable spring rate introduced because of the angularity of the supporting arms. It is interesting to note, he added, that the spring steel in these bar springs weighs 250 lb as compared to the 800 lb of spring steel which would have been required with conventional leaf springs.

Herrington Speaks At 'Closed Session'

■ Metropolitan

Col. A. W. S. Herrington gave the Metropolitan members an off-the-record account of the progress of motorized national defense, and observations of the European mechanized combat tactics on March 12. Stephen Zand, consulting engineer, Sperry Gyroscope Co., recounted some of his recent experiences in France in commenting upon the speaker's remarks.

Arrangements for the meeting were handled by Robert L. Miller, Section Vice Chairman of Transportation & Maintenance. Vice Chairman Clayton Farris presided, and introduced a number of distinguished members and guests, including Col. Herrington's father; Fred M. Young, president, Young Radiator Co., and a former chairman of the Milwaukee Section; and F. E. Moskovics, former president of Stutz Motor Co., and a former member of SAE Council.

Burk February Speaker

High success in thoroughgoing cooperative efforts on the part of automotive engineers, petroleum technologists, and government scientists was reported to the Metropolitan Section, Feb. 20, by Franklin C. Burk, supervising automotive engineer, research and development department, Atlantic Refining Co., Philadelphia.

It is now possible, he pointed out, to combine the octane number versus speed relationship for each gasoline, and the octane requirement and speed curve for each engine to see how well each gasoline satisfies the particular design in question.

This new ability of the industry to "tailor-make" a gasoline blend, or conversely, permitting the engine designer to more accurately build his powerplant to use a given fuel blend with the greatest possible efficiency, is the achievement of the Cooperative Fuels Research method of solving inter-industry problems, he pointed out.

A. M. Rothrock, National Advisory Committee for Aeronautics, described the process of engine combustion while showing a slow-motion picture of this phenomenon.

Cites Economic Value of Automobile Improvements

■ Northwest

"The automobile is no longer classed as a luxury, but as a necessity," speaker Wallace Linville told the Northwest Section on Feb. 4. ". . . a necessity in helping us to compete in a very competitive world."

Mr. Linville, who is chief automotive engineer for the General Petroleum Corp., addressed the Section on "Mechanical Improvements in 1941 Motor Vehicles." Continuing, he said, "Any new feature or new improvement rendering the automobile more efficient renders us more efficient and in so doing should hold more than just a casual interest."

Following are a few of Mr. Linville's observations regarding the new cars:

"This thing called accessibility is 'getting no better faster' – today, as in 1940, the best source for a new mechanic is a high school acrobat – mechanically inclined."

"Nash (in two models), Buick and Chevrolet have undoubtedly retained the overhead valve design for the same reason that Del Monte puts peaches up in cylindrical cans. Outside of a perfect sphere, and that would roll off the shelf, a cylindrical-shaped container will enclose the greatest amount of peaches by using the least amount of tin. This reasoning applied to a heat engine means the greatest amount of combustible material with the least amount of area to dissipate heat."

"Chevrolet's new polarity switch, in effect, is accomplishing for them the same long point life of a magneto (which makes and breaks an alternating circuit) and yet still deals with a direct-current system."

"The fluid coupling is basically very sound. It overcomes a noticeable imperfection of a small-bore, low-torque, high-speed engine."

"Ford's front fender is now fabricated from three metal stampings. In case of accident any damaged sections can be replaced – a feature that should appeal to the man whose wife drives his car."

"Pontiac is utilizing a very clever oil pump pressure release, consisting of a steel end plate, backed by two coil springs."

"Small and trivial is the past – it is the future which is vast. So too it is with the automotive industry – the improvements of today are soon to be eclipsed by the accomplishments of tomorrow."

Diesel-Engine Paper Stimulates Discussion

■ Indiana

"Developments in Supercharging High-Speed High-Output Diesels," a paper by H. L. Knudsen, chief engineer, Cummins Engine Co., evoked considerable discussion at the Indiana Section's Feb. 15 meeting.

Among queries coming from the 28

Military Officers on San Diego Program

members and guests attending was Lee Oldfield's question: "What has been done to overcome the harder starting of supercharged diesel engines, which in some cases has been reported as serious?" Mr. Knudsen replied that the Cummins-type engine always has been on the easy-starting side, and that in their supercharged models they have taken measures to overcome hard starting, including the addition of a spark plug and special pump (using the same fuel) which go out of operation as soon as the engine starts. Even in extreme conditions, he said, their experience has been that the hard-starting bogey has been overcome.

Road-side fuel supplies came in for condemnation and were likened to watered milk by one discusser. The fuel picked up along the road, said another, is sometimes "swimming in water" and the strainers in the engines don't seem to be able to handle it. It fouls the injectors and causes plenty of trouble, he added. One technical man suggested that "fuel sources should supply dehydrated fuel for diesels," adding, "otherwise we may have to drill the case and add a water gutter."

National Production Meeting Postponed

The SAE 1941 National Production Meeting, originally scheduled to be held in Milwaukee, Wis., May 12 and 13, has been postponed indefinitely because of the urgency of national defense production requirements.

(Above, from left) Major-Gen. Jacob E. Fickel, U. S. Army, speaker, with Headtableites Claude T. Ryan, president, Ryan Aeronautical Co., and E. N. Gott, vice president and director of public relations, Consolidated Aircraft Corp.

(Left) Major-Gen. William P. Upshur, U. S. Marine Corps., served as toastmaster, introducing 18 important aircraft officials seated at the head table. Gen. Upshur complimented the SAE upon its "amphibian" scope – including land vehicles as well as vehicles that fly through the air

Tomlinson Predicts Stratosphere Bombers; Major-Gen. Fickel Discusses Air Defense

■ So. California

"BEFORE this war is over, I predict that we will see a great deal of pressurized-cabin bombers operating over long distances at altitudes of 40,000 ft or even higher." This forecast of D. W. Tomlinson, vice president, Transcontinental & Western Air, was included in his paper which shared the Aircraft and National Defense Meeting program of the Southern California Section, with an address by Major-Gen. Jacob E. Fickel, General Headquarters Air Force Commander for the Southwest.

San Diego was the scene of the Feb. 28 meeting which drew more than 250 members and guests from miles around. Major-Gen. William P. Upshur, commanding the Marine Corps Base at San Diego, was toastmaster, and SAE Vice President Mac Short, vice president for engineering, Vega Airplane Co., presided as technical chairman. Capt. Lawrence J. Chiappino, a veteran airline pilot now flying Stratoliners for TWA, read Mr. Tomlinson's paper.

"We will probably hear in the very near future of 4-engined long-range day bombers with supercharged cabins operating between 30,000 and 40,000 ft," said Mr. Tomlinson. "Bombing aircraft flying at these great altitudes possess distinct advantages," he continued. "It is extremely difficult to sight aircraft during perfectly clear weather when flying above 30,000 ft. Interception at these levels will be difficult, and having accomplished the interception, the pursuits will be virtually impotent unless they incorporate pressurized provisions for the pilot, and pressurizing of the cockpit of a fighter is a terrific problem and will handicap the performance of the pursuit plane to a much greater extent than does the pressurizing of a large bomber.

"Being capable of flying above 98% of the clouds will give the bomber crews the advantage of being able to navigate continuously by celestial observations. This method of navigation from a steady platform giving unrestricted opportunity for taking sights, can be extremely accurate . . . The complete absence of turbulence and relative freedom from attack will permit long and accurate bombing approach . . . Although accuracy will be affected at times because of high winds, this will be offset by the greater velocity reached by the bomb in the upper levels.

"This military development of stratosphere operation," Mr. Tomlinson continued, "will pave the way for peacetime utilization of such flying to link all nations, all people, closely together. The time now required for transoceanic flights should be cut in half and, at the same time, factors of safety and comfort of air travelers will be increased proportionately to the increase in

speed." In earlier portions of his paper, the substratosphere pioneer traced the development of high altitude flying and recounted some of his experiences during research flights above 30,000 ft.

Gen. Fickel, in introducing his paper, declared that the Army's air power is founded on bases, airplanes, men and a strong manufacturing industry – and that these elements are *equally* important in attaining an adequate air defense. Looking back to 1939, just after the start of the Air Corps' first expansion program, when he made an earlier talk before the SAE, Gen. Fickel recalled: "At that time we set our goal at 4600 pilots, 43,000 enlisted men, and 5500 airplanes of all types by August of 1941 . . . Now," he added, "airplane authorization has jumped to 14,000 in 1941 and personnel authorization to over 170,000."

Commenting on air bases, Gen. Fickel stated that "an examination of what has been done and is being done, indicates that this essential element of air power will be provided by the summer of 1941."

On the second necessary element, airplanes and other equipment, he declared: "The inventive and designing ability, and the research and productive capacity of the United States is second to none. We have been keeping both technical and tactical observers in the belligerent countries, and have been able, by the study of their reports, to utilize the battlefield as a laboratory and to keep well abreast of developments."

To meet the total strength of 170,000 officers and men called for, the training program has been speeded, Gen. Fickel reported. Officer training was rapidly stepped up beginning in July, 1940, by increasing the number of students per class, shortening the courses, and increasing the number of schools. At the present time, he said, over 1600 students enter the primary schools every five weeks. Of these, nearly 900 will be graduated as pilots, and about 300 as navigators, observers and bombardiers 36 weeks hence. The enlisted training program, he added, also has been stepped up twice and is well ahead of schedule.

Aircraft manufacture, the fourth factor in Army air power, brought praise from Gen. Fickel. Fully recognizing the problem faced by the industry when the national program brought an avalanche of orders, he complimented its ability to organize to meet the emergency. He quoted reports of estimates that 800,000 workers will be needed eventually as compared with 35,000 in 1938, and that the industry's present plans call for production to be increased to a rate of 50,000 planes per year by 1942. "Such an industry," he concluded, "could maintain in the field an air force of double the present program . . . supply Naval needs, and also furnish considerable equipment to our allies."

SAE Constitution and By-Laws Are Amended

Amendments to sections C-11, C-15, and C-18 of the SAE Constitution, submitted to the membership for mail ballot on January 31, have been adopted by a vote of 1318 to 14, the tellers of election announced following the counting of the ballots on March 3. On June 9, 1940, the Council approved an amendment to section B-1 of the Society's By-Laws, it being understood that this amendment would become effective when the amendments to the Constitution should be adopted. The effect of these amendments is to make the qualifications of Affiliate Members and Affiliate Member Representatives more specific and in line with the qualifications of other grades of membership in the Society.

The amendments to the Constitution and the By-Laws take effect immediately following this announcement of adoption.

Bridgeman Urges Fewer Fuels and Lubricants

▪ *Washington*

"There is no need for the great variety of fuels and lubricants available commercially," declared Dr. Oscar C. Bridgeman, chief of lubrication and liquid fuels section, Division of Heat and Power, National Bureau of Standards, in addressing the Washington Section, Feb. 11.

He pointed out that three octane grades and four volatility grades of gasoline are available for automobile use and that two octane grades are being marketed for aircraft engines. With some attention given to design, principally to eliminate vapor lock, one grade of high quality gasoline could be used for all, he stated.

The lack of standardization of diesel fuels was emphasized by Dr. Bridgeman, who said that there is almost a different fuel for each make of engine. One grade, in his opinion, would be sufficient.

In regard to automotive lubrication, the speaker posed the question as to the necessity for four viscosity grades of oil and advocated the use of one high quality SAE 20 oil. Differences in performance would not be appreciable he stated. Lubricants having a V. I. number of 125 are commercially available, he pointed out, adding that such an oil will take the place of two and possibly three ordinary oils for low temperature operation. For extreme low temperature the oil may be diluted, he said.

In the discussion following, Oscar Meyers, Quartermaster Corps, concurred with the speaker in the desirability of using one lubricating oil. For very cold operation, he said, the Army dilutes oil with 50% kerosene. This permits starting at 50 deg below, he added.

C. M. Larson, Sinclair Refining Co., stated that the multitude of products available is the result of four problems with which the refiner is confronted. First, he said, equipment design, such as oil seals, rings and flow characteristics; second, service conditions such as operating temperature; third, economics, and fourth, personal equation.

Activity Takes New Name

"Truck & Bus Activity" is the new name of the SAE professional activity formerly known as the "Truck, Bus & Railcar Activity." Final action bringing about this change was taken at the March 12 meeting of the SAE Council, at which time Section B-39 of the Society's Constitution was so amended.

The Truck & Bus Activity is cooperating with the Society's Transportation & Maintenance Activity in making arrangements for a National Transportation & Maintenance Meeting to be held this Fall.

Engineers Learn How Car Advertising is Prepared

▪ *Detroit*

Automobile engineers heard how the products of their designs are placed before prospective car buyers when Lee Anderson, president, Lee Anderson Advertising Co., and Peter A. Revelt, account executive of the company, addressed the Detroit Section's March 10 meeting.

Their presentations climaxed a day filled with activity for the younger members of the Society in the Detroit area. The Chrysler Corp. was host to student members and the Section's governing board at a luncheon, followed by a tour through the company's laboratories. At the close of the trip, Chrysler's chief electrical engineer, P. J. Kent, delivered an inspirational discourse entitled "Faith." A special rate was extended to the students for the dinner.

"Advertising – Engineering's Interpreter to the Buying Public," was the theme of the two talks. Introducing the subject, Mr. Anderson declared that the engineer, by constantly producing betterments in his products, furnishes the advertising agency with material by which it can capture the public's attention and produce the buying urge. The newer and more exciting the theme, he added, the better the chance for advertising to serve its purpose.

Mr. Revelt dealt more definitely with the technique and methods of developing advertising. He showed the engineering group how an advertising agency lays out a campaign, beginning with the initial conferences on new products with sales and advertising departments and going through the intermediate steps until the final advertisement appears in the publications or media for which it is planned.

ACAD Work Completed Says C. C. Carlton

▪ *Detroit "Coffee"*

The Automotive Committee for Air Defense has planted "bomber seeds" and completed the task assigned to it, C. C. Carlton, director of the committee, revealed in his "Coffee Talk" at the Detroit Section's March 10 meeting. Mr. Carlton gave a complete and final report on the progress made to date, outlining the aircraft production programs that have been undertaken by General Motors, Ford, Chrysler and Goodyear. He explained that the ACAD faced disbanding, but that the U. S. Army Air Corps, under Major James Doolittle, would continue to maintain the exhibit of aircraft sub-assemblies and parts at the West Warren Ave. plant of Graham-Paige, where the ACAD has had its headquarters.

Reviews Applications of Hydraulic Transmissions

▪ *So. New England*

Speaking on "Hydraulic Transmission of Power," K. R. Herman, vice president, Vickers, Inc., addressed 130 members of the Southern New England Section, March 5. A special guest at the meeting was SAE Assistant General Manager E. F. Lowe, who

spoke briefly on current activities of the Society.

Beginning his talk with word sketches of the earliest hydraulic applications, Mr. Herman traced the progress of hydraulic transmission of power from the spiral of Archimedes to modern gear and vane pumps and hydraulic motors of the piston type, both with and without variable stroke.

Particular interest was shown in Mr. Herman's description of a vane pump with equalized pressure on the bearings and on the vanes while sliding. He explained that by having two suction and pressure connections diametrically opposed, the bearing loads are equalized. By using four circular arcs in the casing with centers on the shaft axis, he said, the vanes are kept from sliding while picking up the load. After passing the discharge port, he added, the high pressure is on both sides of the vane and, consequently, sliding action at this time will not cause undue wear.

Among modern industrial applications of hydraulic drives and controls mentioned by Mr. Herman were: hydraulic drives for

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SAE Coming Events

June 1 – 6 — Summer Meeting
The Greenbrier – White Sulphur Springs, W. Va.

Sept. 25 – 26 — National Tractor Meeting
Schroeder Hotel – Milwaukee, Wis.

Oct. 23 – 24 — National Fuels & Lubricants Meeting
Mayo Hotel – Tulsa, Okla.

Oct. 30 – 31 & Nov. 1 — National Aircraft Production Meeting
Biltmore Hotel – Los Angeles, Calif.

Baltimore – April 10

Engineers Club; dinner 6:30 p. m. Bearings and the Part They Play in National Defense – Albert B. Willi, Federal Mogul Corp.

Buffalo – April 9

Markeen Hotel; dinner 6:30 p. m. Rubber – Walter C. Keys, mechanical product engineer, U. S. Rubber Co.

Canadian – April 18

Prince Edward Hotel, Windsor, Ontario; dinner 6:30 p. m. Speaker to be announced.

Chicago – April 1

Chicago Towers Club; dinner 6:45 p. m. Military Type Motor Vehicles – Their Design and Uses – Robert Cass, executive engineer, White Motor Co. Driver Training for Military Purposes – William A. Sears, supervisor, safety education, Chicago Board of Education. Business Session of SAE Tractor & Industrial Power Activity Committee for election of members to Activity's Nominating Committee.

Cleveland – April 7

Cleveland Club; dinner 6:30 p. m. Engineering Properties of Rubber and Their Utilizations – Roy W. Brown, manager, Air Springs Department, Firestone Tire & Rubber Co.

Dayton – April 7

Biltmore Hotel; dinner 6:30 p. m. Defense Activities in Automotive Field – A. W. S. Herrington, president, Marmon-Herrington Co., Inc.

Detroit – April 15 & 28

April 15 – Durant Hotel, Flint, Mich; dinner 6:30 p. m. Relation Between Engineering and Production – B. D. Kunkle, vice president, General Motors Corp. Coffee talker: W. F. Hufstader, vice president and general sales manager, Buick Motor Division, General Motors Corp.

April 28 – Hotel Statler, Detroit; dinner 6:30 p. m. Closed Meeting for SAE members and applicants. Development of the Allison Aircraft Engine – R. M. Hazen, vice president and chief engineer, Allison Division, General Motors Corp.

Indiana – April 11

Antlers Hotel, Indianapolis; dinner, 6:45 p. m. Purdue University Student Engineering Meeting. Testing Three Grades of Auto Fuel – M. L. Smitley. New Purdue Aircraft Laboratory – W. R. Woodward. Advance Civilian Aeronautics Training – Larae Teel.

Kansas City – April 18

Hotel Continental; afternoon and evening sessions. Tractor Maintenance – A. W. Lavers, chief engineer, automotive division, Minneapolis Moline Power Implement Co. Plastics – New Engineering Materials – W. B. Hoey, district manager, Bakelite Corp. Airline Maintenance – R. A. Miller, American Airlines, Inc. Heavy Duty Motor Oil – C. M. Larson, chief consulting engineer, Sinclair Refining Co.

Metropolitan – April 17

New Yorker Hotel; dinner 6:30 p. m. England Under Fire – Frederick C. Horner, assistant to chairman, General Motors Corp.

Milwaukee – April 30

Participation in Wisconsin Engineering Conference to be held April 28-30. Closing session sponsored by SAE Milwaukee Section. Pfister Hotel; dinner 6:30 p. m. Engineering Research as Applied to Airline Operation – R. D. Kelly, superintendent of engineering research, United Air Lines Transport Corp.

Northern California – April 8

Hotel Bellevue, San Francisco; dinner 6:30 p. m. Modern Lubricants – Dr. Ulric B. Bray, Consultant.

Northwest – April 18

Dolly Madison Dining Room, Seattle; dinner 6:30 p. m. Aluminum in National Defense – Prof. G. S. Schaller, Department of Mechanical Engineering, University of Washington.

Oregon – April 11

Lloyd's Golf Club; dinner 6:30 p. m. Instrumentation in Automotive Maintenance Work – Earl A. Marks, Earl Marks Electrical Service.

Philadelphia – April 9

Penn Athletic Club; dinner 6:30 p. m. Ignition System as Related to Automotive Engine Performance – J. T. Fitzsimmons, ignition engineer, Delco-Remy Division, General Motors Corp.

Pittsburgh – April 22

Webster Hall; dinner 6:30 p. m. Meeting at Mellon Institute. Brakes – W. A. Blume, president, American Brakeblok Division, American Brake Shoe & Foundry Co. M. A. Smalley, president, Mechanite Corp.

Southern California – April 11-12 & 18

April 11 & 12 – Elks Temple, Los Angeles. Tractor and Power Engineering Display.

April 11 – dinner 6:30 p. m. Application of Tractors to Industry – B. L. Hagglund, Caterpillar Tractor Co. A New High Speed Engine Indicator – E. E. Simmons, California Institute of Technology.

April 12 – luncheon 12:30 p. m. Mechanical Testing of Engine Materials – Norman C. Parrish, University of Southern California. Lubrication Problems of Tractors and Power Equipment – Frank N. Scott, Jr., University of Southern California. Application of Butane to Tractor and Power Equipment – James T. McKnight, University of California at Los Angeles.

April 18 – Deauville Club, Santa Monica. Subject: Aircraft Materials.

Southern New England – April 2

Hotel Bond, Hartford, Conn.; dinner 6:30 p. m. Turbo-Superchargers – S. R. Puffer, engineer, Supercharger Department, General Electric Co.

Washington – April 8

Garden House, Dodge Hotel; dinner 6:30 p. m. The Story of Neoprene – V. A. Cosler, E. I. du Pont de Nemours & Co. Also sound film entitled The Story of Neoprene.

Wichita Group – April 17

Allis Hotel, Aviation Room; dinner 6:30 p. m. Airline Maintenance – R. A. Miller, American Airlines, Inc.

About SAE Members

A. J. BRANDT has resigned his business connections as president of A. J. Brandt, Inc., consulting engineers, and as president of the National Tool Co., Cleveland, to become chief of the Manufacturing Unit, Aircraft Section, Division of Production, Office of Production Management.

R. A. WATSON, Federal Mogul Corp., has been named factory manager of the company's Pacific division, San Francisco.

R. A. Watson
Factory
Manager

He formerly was engineer in charge of the division. Mr. Watson is chairman of the SAE Northern California Section.

F. F. SCHWILK, formerly general sales manager of Continental Motors Corp., has been named a vice president of the organization.

To succeed **BRINT EDWARDS,** who is now with the St. Louis Airplane Division of Curtiss-Wright, **MAC SHORT** has been named vice chairman of the Southern California Section. Mr. Short, who is vice president in charge of engineering, Vega Airplane Co., was the Section's vice chairman for aeronautics. He is succeeded in this post by **FOSTER M. GRUBER,** design engineer, Douglas Aircraft Co.

J. BAMFORD, chief methods engineer, Rolls-Royce Ltd., Crewe Division, Crewe, England, recently was elected a Fellow of the Royal Society of Arts, an honor extended to men who have attained eminence in science of commerce, arts and industry. To SAE members engaged in work resulting in aid for Britain, Mr. Bamford, in a recent letter, urges that they "put their backs into it for all they are worth and adopt the slogan which England adopted in the early days of the war – 'Go to it.' "

RAYMOND P. LANSING, formerly general manager, Eclipse Aviation Division and Pioneer Instrument Division, Bendix Aviation Corp., has been named a vice president of the corporation.

JOHN E. McELROY and **ZYGMUNT JAROS,** respectively senior test engineer and experimental tester, Wright Aeronautical Corp., Paterson, N. J., have been transferred to Wright Aero Ltd., Los Angeles subsidiary of the corporation.

F. C. CRAWFORD, president, Thompson Products, Inc., Cleveland, heads the aviation division of Automotive Parts & Equipment Manufacturers, Inc., which recently was organized to meet the demands of association members engaged in aviation parts work in connection with the national defense program.

COL. G. A. GREEN, vice president, General Motors Truck & Coach Division, Yellow Truck & Coach Mfg. Co., who recently was appointed consulting engineer to the Secretary of War, has been named to succeed the late Col. W. G. Wall as vice chairman of the SAE Ordnance Advisory Committee. **R. M. SCHAEFER,** manager, hydraulic department, Twin Disc Clutch Co., has been named a member of the committee.

ALEXANDER T. BURTON, formerly announced as division manager of North American Aviation's new plant near Dallas, Tex., has been assigned the company's representative at Washington, D. C., it recently was announced by **J. H. KINDELBERGER,** president of North American Aviation, Inc., and North American Aviation, Inc., of Texas.

MAJOR ARTHUR H. DENISON, U. S. Army Air Corps, has been relieved from duty at Wright Field and assigned to duty as assistant district supervisor and Air Corps factory representative at North American Aviation, Inc. of Texas, Dallas, Tex. Construction of this new plant is nearing completion, and it is expected to be in operation by the middle of this month.

ALAN C. TULLY has been appointed by the Ethyl Gasoline Corp. as manager of its Atlanta division. Before assuming his

Alan C. Tully
Transferred

new post, Mr. Tully was assistant manager of Ethyl's Dayton division.

GEORGE SHERMAN, formerly sales engineer in the mechanical rubber goods division of the U. S. Rubber Co., has joined the Wolverine Fabricating & Mfg. Co., Inc., Detroit, as sales engineer.

The SAE Pittsburgh Section has named **THOMAS G. MURPHY** its vice chairman for the Oil City area. Mr. Murphy is chief chemist, Franklin Creek Refining Co., Franklin, Pa.

HARRY J. CARMICHAEL, former General Motors of Canada vice president who resigned that post to become assistant chairman of Canada's Wartime Requirements Board in January, on Feb. 10, was appointed director general of munitions production, Department of Munitions & Supply, Dominion Government, Ottawa.

Appointment of **R. C. BERKINSHAW,** manager, Goodyear Tire & Rubber Co. of Canada, as director general of the priorities branch of the Canadian Department of Munitions and Supply has been announced by C. D. Howe, Supplies Minister.

LT. R. C. HALL, Quartermaster Corps, is motor transport officer at the Aberdeen Proving Ground, Md. Before entering the Army, Lt. Hall was automotive engineer with the Baltimore Transit Co., Baltimore, Md.

C. M. KALTWASSER has been named to the general managership of Stinson Aircraft, division of Vultee Aircraft, Inc., at Wayne, Mich. Backed with experience in construction of cruisers and destroyers for the U. S. Navy, production of automobile axles and carburetors, and the manufacture of military and commercial planes, Mr. Kaltwasser was appointed to his new

C. M. Kaltwasser
Stinson G.M.

post after a year at Vultee plants in Nashville, Tenn., and Wayne. He has been vice president of the Timken-Detroit Axle Co., executive vice president of the New York Ship Building Corp., and president of the Marvel-Schebler Carburetor Co. The Stinson plant currently is concentrating on production of three-place private planes and is developing a light training plane for military use.

T. C. SMITH, American Telephone & Telegraph Co., has been appointed by the Council to represent the SAE on the National Conference on Uniform Traffic Accident Statistics.

DIMITRIUS GERDAN, formerly with the Detroit Diesel Division of General Motors Corp., is design project engineer with the Allison Engineering Division, Indianapolis.

HANS BOHUSLAV, chief engineer of the Enterprise Engine & Foundry Co., San Francisco, has been promoted to vice president in charge of engineering.

W. E. LERCH is now a partner of Douchkess & Lerch, industrial management technical consultants, 185 Madison Ave., New York.

L. **P. SAUNDERS,** chief engineer, research division, Harrison Radiator Division, General Motors Corp., has been elected to

L. P. Saunders
Elected

serve for the next three years on the National Council of the American Society of Heating and Ventilating Engineers.

C. C. **CARLTON,** director, Automotive Committee for Air Defense, and **A. H. d'ARCAMBAL,** president of the American Society of Tool Engineers, and metallurgist, Pratt & Whitney Division, Niles Bement Pond Co., were among those scheduled to take part in the program of technical sessions which was held in conjunction with the 1941 ASTE National Machine & Tool Progress Exhibition and Annual Meeting held in Detroit, March 25-28.

EDGAR LEE MOSSHAMER, who has been junior automotive engineer, Socony Vacuum Oil Co., Detroit, has been transferred to the Ohio district and advanced to the post of automotive engineer. His headquarters are in Cleveland.

"No industry is in better position to aid the defense program than the oil industry," **WILLIAM H. HUBNER,** refinery technologist, Ethyl Gasoline Corp., told the Wichita Section of the American Chemical Society at a recent meeting. "Even now," he said, "gasolines that probably would be adequate for most of the Army's mechanized war equipment can be obtained at 90% of all service stations."

PAUL WILLIAMS, former general manager of Skinner Purifiers, Inc., Detroit, is now affiliated with Lawrance Engineering & Research Corp., Linden, N. J.

VALENTINE GEPHART, for 16 years president of the Valentine Co., Seattle, Washington, has taken a leave of absence

Valentine Gephart
Engineering Officer

to serve during the period of national emergency as captain in the United States Marine Corps Aviation Reserve. He is engineering officer at the Reserve Base Naval Air Station, Seattle.

Since March 1, **FREDERICK W. SEVIN,** who was automotive engineer, Ohio district, Socony Vacuum Oil Co., Inc., has been manager of the fleet sales division, White Star-Ohio Division of the company. He is located in Detroit.

ROGER F. WINCHESTER, since late in February, has been liaison engineer with Consolidated Aircraft Corp., San Diego. Previously, he was tool maker with the Allison Division, General Motors Corp., Indianapolis.

GUSTAV INGOLD has been named director of the Plattsburgh School of Aviation, Plattsburgh, N. Y., which trains students in the fabrication, riveting, and assembly of airplanes. The school is a part of the University of the State of New York, State Education Department.

R. M. MILLS has been appointed director of personnel, J. G. Brill Co., Philadelphia. Mr. Mills was formerly manager of the company's dining-car division, and prior to that had been connected with the General Motors Export Co. and the United States Rubber Co.

After some months in the British Army, **A. C. SAMPIETRO,** was transferred to the Army Reserve so that he could resume his work in the engineering department of Humber Ltd., and at the same time serve in the Home Guards. Upon his return to Humber, he was placed in charge of all

A. C. Sampietro
Back at Humber after British Army Service

long-distance research. Commenting upon the bombing attack suffered by Coventry (where the Humber works are located) Mr. Sampietro wrote: "As you probably read, our town received a few unwelcome visits but our works were so well defended that no damage was caused . . . we are not perturbed in the least."

Since Feb. 7, **CAPT. CYRIL C. LAWTON,** U. S. Army, Quartermaster Corps, has been located at Camp Lee, Va.

R. E. BUSEY, who has been engineer, experimental department, for the White Motor Co. in Detroit, recently was transferred to the company's home office in Cleveland.

New England Section Vice Chairman **SETH B. ROBINSON, JR.,** sales supervisor, Lever Bros. Co., Cambridge, Mass., on March 1 reported to the 26th Division, U. S. Army, for service. He has been a reserve officer for 10 years.

LAURIE C. SMITH is associate engineer, diesel design, Bureau of Ships, Navy Department, Washington, D. C. Prior to taking this post he was assistant mechanical engineer, diesel design, Bureau of Engineering, Navy Department.

THOMAS J. LITLE, JR., according to a late February announcement, has been appointed director of engineering for Bendix Home Appliances, Inc., South Bend, Ind. Mr. Litle goes to Bendix Home

Thomas J. Litle, Jr.
To Bendix H.A.

Appliances from the Easy Washing Machine Co., where for four years he was chief engineering executive. Earlier in his career, Mr. Litle was director of engineering and production for the Lincoln Motor Car Co., and during the first World War collaborated with Packard, Ford and Cadillac in the development work and production of the Liberty Motor, under Government direction. After the purchase of the Lincoln Motor Co. by Ford, he became engineering executive of the Lincoln Division and acted as personal engineering adviser to **HENRY FORD.** During this period Mr. Litle was president of the SAE. Other posts held by Mr. Litle include those of director of research with Cadillac and chief engineer for the Copeland Refrigeration Co. of Detroit.

CARLETON E. STRYKER, chief, Standards Coordination Unit, Aircraft Section, Office of Production Management, has been added to the membership of the Society's Aircraft Activity Committee.

ROBERT H. BENNEWITZ, who graduated from the University of Wisconsin in February, has joined the Linde Air Products Co., Newark, N. J., as development engineer.

On Safety Program

A number of SAE members are actively participating in the program of the 12th Annual Safety Convention and Exposition of the Greater New York Safety Council, April 22-25. **DAVID BEECROFT,** Bendix Products Division, Bendix Aviation Corp., represents the Society on the general committee, and **LESLIE PEAT,** industrial research, is chairman of the publicity committee. Among SAE men scheduled to present papers are: **E. W. McVITTY,** Pan American Airways System; **RALPH S. DAMON,** American Airlines, Inc.; **W. G. CHANDLER,** Brooklyn Edison Co.; **J. W. LORD,** Atlantic Refining Co.; **WALTER PEPER,** Smith & Gregory; and **H. H. KELLY,** Interstate Commerce Commission; and **DR. MILLER McCLINTOCK,** Bureau for Street Traffic Research, Yale University.

J. T. THOMPSON, chairman of the Eastern division, National Aircraft Standards Committee, announced at the close of a two-day meeting in Buffalo, Feb. 18-19, that participating engineers, representing several of the nation's leading aircraft companies, had agreed on the use of a standard rivet, standards for hinges and close-tolerance bolts, and a simplification of existing standards for extruded shapes. Mr. Thompson is standards engineer of the Glenn L. Martin Co., Baltimore.

"Highway Safety and Automobile Styling" is the title of a new book by **ARTHUR W. STEVENS,** which is published by the Christopher Publishing House, Boston. Mr. Stevens has been a member of the Massachusetts Safety Council and is author of articles on automobile design and its relation to highway safety.

Crawford and Berna Open Defense Broadcast Series

"If we are going to build up our production of airplane engine parts, we need more and more machine tools," **F. C. Crawford,** president, Thompson Products, Inc., declared on the initial "Defense for America" radio program sponsored jointly by the National Association of Manufacturers and the National Broadcasting Co. Another SAE member on this program, which was devoted to the machine tool industry and its part in defense, was **Tell Berna,** general manager of the National Machine Tool Builders Association.

Mr. Crawford praised the machine tool industry for the progress it is making, and commented that each airplane engine has some 8000 separate parts – and every one of these has to be machined.

Pointing out that it takes from four to eighteen months to build some of the machine tools that are required for production today, Mr. Berna explained: "First, machine tool builders had to find out just what military equipment was needed. Then they had to plan and design machine tools that would make that equipment, and next they had to manufacture these machine tools in a hurry and in quantities far exceeding any past demands in the history of the nation."

"Aircraft Manufacture" was the second of the 13-broadcast series. Southern California was the locale, and broadcasts were made from several of the big aircraft factories. SAE Member **Hall Hibbard,** vice president and chief engineer, Lockheed Aircraft Corp., was among the speakers depicting the pace aircraft manufacturers are setting in meeting defense demands.

"Defense for America" broadcasts are scheduled for each Saturday, over the NBC's Red Network, between 7:00 and 7:30 p.m. A broadcast covering the automobile industry's part in defense is scheduled for April 26.

HENRY L. BROWNBACK received radio prominence March 3, when Arthur Hale, commentator for Transradio's "Confidentially Yours" program told of Mr. Brownback's plan to cast radial-engine cylinder blocks and crankcases together, and stressed the possibility of its use in speeding production of radial engines for aircraft and tanks. "Development of the Radial Engine for Military Use," an article by Mr. Brownback, appearing in the Feb. 15 issue of "Automotive Industries," traces steps in the development of this plan.

Honored

D. W. Tomlinson

D. W. TOMLINSON, Transcontinental & Western Air's vice president in charge of engineering, has been voted Kansas City's outstanding aviation figure of 1940 for his experimental flying in the substratosphere preceding the airline's inauguration of a fleet of four-engined Stratoliners. The award was announced by the National Aeronautical Association's Kansas City chapter. Mr. Tomlinson, in a "test-tube" Northrup Gamma plane, spent more than 50 hr above 30,000 ft in his experiments.

R. I. DICK, treasurer of the SAE Milwaukee Section, represents the Section on the Board of Delegates arranging the Wisconsin Engineering Conference, Hotel Pfister, Milwaukee, April 28-30. The SAE Section is participating in the Conference by sponsoring its closing-session program. The speaker will be **R. D. KELLY,** superintendent of engineering research, United Air Lines Transport Corp., and his topic, "Engineering Research as Applied to Airline Operation." An added feature will be the Waukesha Motor Co. Glee Club of forty voices. The theme of the three-day meeting is "Engineering – the Key to National Defense."

PAUL W. WEBB, formerly managing editor, Chek-Chart Corp., Chicago, is now affiliated with the service technical division, Chrysler Corp., Detroit.

I. M. LADDON, engineering vice president of Consolidated Aircraft Corp., San Diego, since 1935, has had his responsibilities extended to include those of works manager.

FRED W. ZELLMER, formerly on the staff of the Hancock College of Aeronautics, Santa Monica, Calif., is flight engineer with the Consolidated Aircraft Corp., San Diego.

E. F. MORGANA is affiliated with the B.G. Corp., New York. He was assistant project engineer with Wright Aeronautical Corp., Paterson, N. J.

DR. NORTON B. MOORE, formerly professor in charge of aeronautical engineering, University of California, is chief research engineer, St. Louis Airplane Division, Curtiss-Wright Corp.

COL. GLEN F. JENKS, president of the American Welding Society, has announced an Aircraft Steel Welding Prize Contest conducted by the AWS. Awards will be made for the best papers submitted "to advance the art of welding aircraft steels, including tubing and other steel parts for tubular assemblies." There will be one $300 prize, one $200 prize and additional prizes totaling $100. The contest is open to any resident of the United States. Papers must be submitted prior to Aug. 18, 1941. Further information may be obtained from the American Welding Society, 33 West 39th Street, New York.

(*About SAE Members concluded on page* 38)

Paul M. Marko

Paul M. Marko, former president of the Marko Storage Battery Co., Inc., Brooklyn, N. Y., died on Jan. 13. He had been retired from active business for a number of years and was a resident of Kew Gardens, Long Island. He was 63 years old.

Before establishing his own company some 30 years ago, Mr. Marko had been in the employ of several storage battery manufacturers. He held a number of patents on storage batteries.

Mr. Marko was elected an associate member of the Society in 1914 and was transferred to member grade in 1919.

William W. Crawford

William W. Crawford, for many years president of the Edward Valve & Mfg. Co., East Chicago, Ill., died Feb. 19, at Miami Beach, Fla. He was 58 years of age.

An active figure in Chicago industry, Mr. Crawford had been president of the Edward Valve & Mfg. Co. since 1921, and had held other important posts including the presidency of the McClellan Refrigerating Co., secretary-treasurership of the Chicago & Interurban Traction Co., and membership on the board of directors of the Walker Vehicle Co. He also had been secretary and manager of the Chicago Automobile Club. He became an associate member of the SAE in 1926.

John J. Burke

John J. Burke, who for the past 12 years was manager of the General Tire Co. of New York, died Jan. 29, following a heart attack. Mr. Burke had been connected with the tire industry for 26 years. Before joining General, he was affiliated with Kelly-Springfield, Firestone and, for a time, president of his own company, The Raritan Tire Co.

Mr. Burke was 51 years old, and had been an associate member of the Society since 1936.

Civil and Military Technical Gains Flashed at Aero Meeting

(*Continued from page 17*)

that the life of nearly every individual in this country has been profoundly affected, it may be truthfully said that very little is actually known of the highly complex mechanism by which the chemical energy latent in a fuel is converted into mechanical force upon a piston," Dr. Fiock averred in his appraisal of the present status of combustion research. Even though the immediate objectives of individual studies are seldom highly practical, he continued, these studies are responsible for the gradual accumulation of isolated bits of information that will some day lead to the evolution of a comprehensive picture of the explosion process.

Stressing the need for coordination in this work, he contended that the "only hope of maintaining the rate of progress of the past three or four decades lies in a carefully planned and comprehensive program of study, executed on a national scale, yet flexible enough to permit immediate attacks upon new and promising issues."

It has long been realized, he pointed out, that practical improvement is possible in the following ways:

1. By finding new mixtures which are inherently more powerful or more economical;
2. By finding new methods of altering the mass rate of burning, the completeness of combustion and, hence also, the rate of increase in pressure;
3. By preventing preignition in spark-ignition engines and facilitating ignition in compression-ignition engines; and
4. By suppressing detonation.

In the remainder of his presentation, Dr. Fiock reviewed briefly a number of the more important contributions made recently to the knowledge of the process of combustion in the engine cylinder.

Discussion

The subject discussed by Dr. Fiock bears a striking resemblance to the "science" of sociology, commented Robert F. Selden, National Advisory Committee for Aeronautics, in prepared discussion read in his absence by Mr. Kemper – a great many facts are evident but the missing links confuse the issue. Each expert therefore feels free to draw his own conclusions.

The main problem in diesel-engine combustion, Mr. Selden argued, is not ordinarily that of getting a short ignition lag, as the author states, but rather in utilizing all the oxygen in the engine as effectively as in spark-ignition engines. Contending that this condition is not entirely a matter of insufficient mixing, he suggested that the remaining difficulty probably arises from the formation of soot in the neighborhood of the fuel spray by virtue of the prevailing low oxygen concentrations and high ambient gas temperatures.

In the remainder of the discussion, Dr. Fiock answered questions from the floor posed by A. L. Beall, Wright Aeronautical Corp., Mr. Mock, Mr. Prescott, and others. Mr. Beall commented that he could recall no experience in aircraft cylinders identifiable with the series of pressure peaks mentioned by the authors. In such a case, he added, "we probably would have to pick the pieces off the floor." In reply to Mr. Mock, who reminded that too much turbulence can blow out the spark, Dr. Fiock emphasized the difference between swirl and small-scale turbulence. Although, as yet, there is no standard means for differentiating between preignition and detonation, Dr. Fiock told another questioner, one is expected soon as a result of cooperative effort. Pointing out that only about 30% of the charge is burned and about 70% compressed into a small space and ignited by auto-ignition during detonation, Mr. Prescott contended that "piston burning" in this case is mechanical erosion caused by thermal expansion and contraction since the radiation increases as the square of the temperature. In reply, Dr. Fiock emphasized that detonation is a progressive process throughout the mass of charge, rather than a spontaneous process.

More Aircraft Engines for National Defense – HENRY C. HILL, Wright Aeronautical Corp.

"WHETHER we like it or not," Mr. Hill contended, "we must face the fact that, in developing the aircraft engine, we also have developed a *brand-new manufacturing technique* which is as far removed from automobile manufacture as the automobile was from carriage building." After expressing his agreement that the automobile mass-production principles must be applied to aircraft and aircraft-engine production, he explained that these principles must be modified and developed further to suit the new standards and the new tempo required in the aircraft field.

"What most people do not realize," Mr. Hill continued, "is that changes in design *are* made more or less frequently in mass-producing industries, and *most frequently in those which produce the best products.*" Defining mass production as "a carefully organized and highly integrated process of producing, in relatively short periods, large quantities of parts which are all *exactly alike*," he emphasized that the parts need be exactly alike *only for a desired production interval*. "If the parts are made fast enough," he explained, "a definite proportion of the working time can be allocated to changing tools and fixtures to incorporate changes in design on the part."

This new technique of producing good aircraft engines in large quantities, he declared, is, first of all, recognition of the methods which have made it possible to develop successful modern engines and produce them in *small quantities*. These methods are the application on a grand scale of research, experiment, and proof-testing under constant pressure to produce practical results. Second, use of the very finest materials and manufacturing processes. Third, *and most important,* provision of flexibility in the manufacturing scheme for continuous absorption of detail improvements as they become available.

Discussion

Supplementing the information given in his paper, motion pictures showing the production of Wright aircraft engines were displayed and explained by Mr. Hill immediately following his presentation.

Replying to a question by K. S. Cullom, CAA, who asked whether it is now desirable to decrease the number of design and production changes on aircraft engines ordinarily made in peacetime, Mr. Hill averred that the changes could not be cut down that, if anything, they would increase. "The war is accelerating development," he pointed out, "and, if we are to keep pace, we will probably have to make more changes than ever before." He revealed that about 60% of the changes made are asked for by the production department.

Cooling Characteristics of Submerged Light Aircraft Engines – H. H. ELLERBROCK, assistant mechanical engineer, National Advisory Committee for Aeronautics.

THE drag, form and cooling, of the exposed wing nacelles of modern multi-engine airplanes, Mr. Ellerbrock reported, is approximately 10 to 25% of the drag of the complete airplane, depending upon the wing thickness. The necessity for reduction of engine-nacelle drag, he continued, has become increasingly important owing to the gradual elimination of other sources of parasite resistance. An obvious refinement for multi-engined airplanes, he pointed out, is the removal of the nacelles from the wings and the enclosure of the complete power-plant within the wing.

Removal of the nacelles from the wings and the use of submerged engines, he qualified, does not mean that the drag of the airplane will be reduced by 25% because thicker, higher-drag wing sections probably are necessary to provide sufficient room for the engines. Submerged engines, he believes, will probably decrease the drag of small airplanes approximately 15%, and the drag of large airplanes about 5%.

One of the main problems with engine installations in the wing, he brought out, is the cooling of the engine. The cylinders must be completely baffled and the cooling air quantity reduced to as low a value as possible. He explained that a low quantity of cooling air is necessary in order that the wing ducts may be small so as to cause little interference with the aerodynamic characteristics of the wing.

An investigation has been started by the NACA, Mr. Ellerbrock announced, to determine the performance of a small airplane with two Continental A-75 aircooled engines enclosed in the wings. He explained that his paper presented the results of tests on one engine to determine the quantity of air and pressure difference required for satisfactory cooling at sea level and at altitude. Tests reported in his paper showed that:

The engine cooled satisfactorily at sea level with wide-open throttle and maximum-power mixture with 4.5 in. of water pressure difference across the baffles and 1.06 lb of cooling air per sec. In addition, from tests on the ground, calculations showed that the maximum cylinder temperature would not exceed the limit of 500 F at 8000-ft altitude with wide-open throttle and either maximum-power or maximum-economy mixture if the pressure difference across the baffles was 2.6 in. of water. The cooling air required with this pressure difference would be ¾ lb per sec. The per cent of the brake horsepower required for cooling with the foregoing conditions at sea level and at 8000-ft altitude would be approximately 1.0 and 0.50 respectively.

Discussion

In discussion, Mr. Ellerbrock elaborated on his description of test results, procedure, and conditions. Participating in the discussion were Peter Altman, Aviation Mfg. Corp.; Mr. Cullom; Kenneth Campbell, Wright Aeronautical Corp.; Karl L. Hermann, consulting engineer; and Fred E. Weick, Engineering & Research Corp.

AIRCRAFT SESSIONS

Chairmen

R C. Gazley **John G. Lee**

In a searching three-paper propeller symposium, aircraft, propeller, and bearing men studied the effects of holding down propeller diameters, the possibility of decreasing bearing clearances as one means of lowering vibration, and the feasibility of propellers of four or more blades. In a session devoted to icing problems in transport aircraft, fresh data on ice-forming conditions were revealed and present anti-icing equipment was appraised critically.

Some Factors Influencing Aircraft Engine-Propeller Vibrations – CHARLES M. KEARNS, Hamilton Standard Propellers, Division United Aircraft Corp.

THE vibratory behavior of several supposedly identical engine-propeller systems has been found to be non-reproducible from time to time, Mr. Kearns revealed, and has given rise to an intensive study of several types of variables. Results of this study show, he reported, that clearances in the vibratory system result in system nonlinearity and have undesirable effects generally, leading to possible serious problems. As a consequence, he pointed out, a design trend toward minimizing such clearances would be desirable. In his discussion of the importance of engine bearing clearance, Mr. Kearns presented an analysis setting forth the source of excitation for engine-propeller whirl vibrations.

Presenting an example of propeller tip failure for which no explanation has been found, Mr. Kearns concluded that "in blade designs susceptible to high-frequency excitation, the individual differences between outwardly identical reduction gears could account for the difference between a satisfactory and an unsatisfactory installation. "Furthermore," he pointed out, "it may be desirable to employ restrictions on operations in regions where these explained or unexplained variables can seriously influence the vibratory condition." Mr. Kearns also discussed briefly special problems relating to propellers with more than three blades.

Discussion

Thomas Barish, Marlin-Rockwell Corp., was first to speak. He stated that bearing manufacturers had been under pressure for some time to reduce bearing clearances, and that he was glad to be enlightened as to the reasons for such demands. He commented upon the possibility of such reduction, which the author had shown to have an important bearing on propeller vibratory stresses.

Mr. Barish pointed out that bearing clearances are dictated by three factors:

(1) The minimum bearing clearance that will insure proper operation of the bearing.

(2) Manufacturing tolerances.

(3) Temperature differentials to be allowed for.

Progress is being made, he declared, in reducing bearing clearances on all three counts just mentioned:

(1) It appears to be possible to reduce the minimum bearing clearances for satisfactory operation.

(2) It will be possible to reduce the effect of manufacturing tolerances if users will abandon the requirement of interchangeability of bearing *parts*. The clearances chargeable to this factor can be reduced from approximately 0.002 to 0.0005 in. It is believed that the small additional cost of replacing bearings as a whole rather than replacing bearing parts should be accepted in order to reduce the clearance attributable to manufacturing tolerances.

(3) The bearing clearance attributable to temperature differential allowance is also being reduced at the present time.

Mr. Barish predicted that within a year this work will result in a real improvement in bearing clearances.

Mr. Kearns took occasion to point out that his Fig. 11, listing the number of propeller failures in flight by years from 1931 to 1940, applied only to domestic airline operations where the maintenance of propellers is known to be under rigid control.

Considerations on the Design of Aircraft Propellers – THOMAS B. RHINES, Hamilton Standard Propellers, Division of United Aircraft Corp.

"CURRENT airplane design trends to more restricted propeller diameters are expensive in propeller weight and propeller performance," Mr. Rhines contended; "they are justifiable only to the extent that small diameter is in itself a source of equal weight saving and performance improvement elsewhere in the airplane." With a restricted diameter assumed, he explained, a compensating increase in number of blades or in blade width is necessary to avoid severe losses. In general, he recommended, the better choice is to increase the number of blades rather than the blade area, at least to a point where cost and complication become prohibitive.

Dual-rotation propellers, Mr. Rhines believes, show theoretical advantages, but the cost in engine weight may limit their use unless vibration considerations make multiblade single-rotation installations impractical. Two-speed reduction gears will be desirable in special cases where improved take-off is required, in spite of an increase in reduction-gear weight. Mr. Rhines considers blade cuffs advantageous in most installations, adding that their design is not critical for use with radial engines, but may often be so for in-line types.

Throughout his presentation Mr. Rhines stressed the importance of design variables on propeller weight.

Discussion

George W. Brady, Curtiss Propeller Division, Curtiss-Wright Corp., expressed agreement with the general conclusions which Mr. Rhines had reached regarding the desirability of using larger propellers than were indicated by present trends, and regarding the desirability of compromising in the direction of a larger propeller when making a selection of size on the basis of high-speed efficiency, since the sacrifice at high speed is slight and the gain in take-off, appreciable.

Mr. Brady concurred in the general conclusions on cuffs. He emphasized especially the difficulty of attaining good junctures between spinner and cuffs when propeller-pitch ranges were of the order of 70 deg, and called attention to the losses which might exist at this point because of gaps or discontinuities.

Chairman Gazley asked whether the author's conclusions would apply to propellers for engines of the 100 to 150-hp class. The author replied that they probably would apply in general, but that he believes the same problems did not arise because the limitations on propeller size do not exist to the same extent as for higher-powered designs.

Vibration Characteristics of Three and Four-Blade Propellers for High-Output Engines – RALPH M. GUERKE, project engineer, Curtiss Propeller Division, Curtiss-Wright Corp.

ALTHOUGH the problems involved in developing a satisfactory engine-propeller airplane installation using propellers of four or more blades are admittedly more difficult than those encountered with a three-blade propeller, Mr. Guerke pointed out, a satisfactory installation can be made "if the airplane designer will assume the responsibility of reducing propeller interference effects." This, of course, may be very difficult if not impossible to accomplish in "pusher" installations, he qualified. Reporting that two such installations have been made in a normal tractor four-blade installation without recourse to odd blade spacing, he contended that successful installations also can be accomplished in propellers of five or more blades under similar conditions.

Dual-rotation propellers, he believes, will introduce additional propeller design problems of a vibration nature which may require certain compromises in diameter, blade construction, and engine gear ratios before satisfactory installations can be made. Mr. Guerke opined, however, that these compromises can be made without sacrificing airplane performance.

In his technical discussion that preceded the foregoing conclusions, Mr. Guerke took up engine excitation; aerodynamic excitation; aerodynamically excited three-blade propeller vibration; aerodynamically excited four-blade propeller vibration; methods of reducing or avoiding aerodynamically excited stress; dual rotation; and effects of propeller isolation on aerodynamically excited stress.

Discussion

Mr. Kearns suggested that it might be disadvantageous to adopt four-blade propellers with unevenly spaced blades because of the gyroscopic forces involved. He pointed out that two-blade propellers of diameters greater than 11 ft were found to suffer for this reason, and that a four-blade propeller of uneven blade spacing appeared to respond very much like two two-blade propellers.

Icing Problems Attendant to the Operation of Transport Aircraft – R. L. McBRIEN, United Air Lines Transport Corp.

A MAXIMUM amount of ice forms on aircraft when the atmospheric temperature ranges between 26 and 30 F, Mr. McBrien revealed, reporting data obtained principally from trip icing logs and test flights conducted on a major transport system. The lowest altitude at which ice was reported varied for the different months, between

6 ft for January and 12,000 ft for May, he brought out.

Although much progress has been achieved in the past in the improvement of all aircraft anti-icing equipment, Mr. McBrien believes that much still needs to be accomplished before air transport operations will be able to operate without regard to possible icing conditions.

Rime, glaze, and frost are the basic types of ice that form on aircraft, he declared, explaining the general effect upon airplane performance of each type of ice formation.

Dividing airplane ice accumulations into two major classes – those producing loss of flight performance and those which serve as an annoyance to the crew – Mr. McBrien pointed out at length when, how and why they are of importance. Among the many slides illustrating his talk were those depicting ice accumulations on the wings, empennage, propeller, pitot mast, and radio loops.

He concluded with a plea for further improvements in airline anti-icing equipment, and for the development of instrumentation means whereby ice accumulations can be better analyzed and reported.

Discussion

Before the meeting was thrown open to discussion of Mr. McBrien's paper, Allan A. Barrie, Western Air Express Corp., presented colored motion pictures which he had taken of aircraft during icing operation.

Discussion was started with a question as to the use, to prevent icing, of double-glass windshields having heat forced into the air space between the panes. Mr. McBrien stated that his company had tried this arrangement but the temperature of 170 F from the regular heating system did not prove sufficient to give satisfactory clearing of icing. This lack of de-icing, he pointed out, was particularly noticed in the case of glaze ice where the windshield was covered completely. The question was next raised as to electrical means of clearing the windshield. Mr. Barrie answered by relating the experiments of his company with electrical resistances but pointed out that this method greatly affected compass readings.

The use of infra-red rays with reflectors was brought up by another discusser, but Mr. McBrien stated that this method had not been investigated.

Mr. McBrien pointed out that the rubber de-icer boot had a travel of about ¾ in. in a cycle of 40 sec. Since it was obvious from the foregoing presentations that there is a need for new ideas on aircraft de-icing, several questions were raised at this time as to what might be done. Mr. McBrien mentioned that preliminary tests on exhaust-heat de-icing were now being carried on by the National Advisory Committee for Aeronautics. Mr. Barrie made the suggestion that the large Army bomber would be most suitable for taking pictures from many angles. He emphasized the need for such additional recorded evidence since the previous reports of pilots have been very conflicting.

Asked what work his company had done on power-driven windshield wipers where de-icing fluids were included, Mr. McBrien stated that United Air Lines had some success with the oscillating-arm type of windshield wiper but that, in their spray test, a large volume of de-icer fluid had been required.

Peter Altman, Aviation Mfg. Corp., asked what evidence of ice had been found on the leading edge of ailerons in trim. It was indicated that ice had been found on that location.

Fred E. Weick, Engineering & Research Corp., inquired how the pilot managed to fly when the windshield was completely iced, and Mr. Barrie explained that, in this case, instruments were used and that some perspective was maintained by vision through the side windows.

With regard to the use of deflectors as has been investigated by the National Advisory Committee for Aeronautics, Mr. McBrien described the effect of large particles of water passing directly to the windshield rather than being deflected with the air stream. However, he added that, in light mist or rain, the water particles were light enough to be deflected with the air stream. Chairman Lee asked about directing heat against the outside of the windshield, and Mr. McBrien stated that no tests had been carried out in this manner, and that there would probably be too great a dilution of the heated air stream.

Mr. McBrien informed the group that his company was using a solution on the propeller blades composed of 85% alcohol and 15% glycerin.

W. H. Hunter, B. F. Goodrich Co., suggested that there was a need for better airplane design along with the design of improved equipment for the elimination of ice from airplanes. He indicated his agreement with Mr. Barrie's suggestion that icing conditions be observed on Army bombers. Mr. Hunter expressed his belief in the great value of photographing icing examples while the airplane was on the ground. He pointed out that an economic way to study the icing problem would be to have the ground crew, pilots, or other specific personnel, photograph any examples of icing on aircraft as they were brought into the airport on scheduled operations.

Mr. Hunter also answered questions as to the extending of the de-icer boot farther back along the chord of the wing. He added that the experiences of icing on the present trim strips will be eliminated by the additional run-back and that a boot of about twice the width of the present one will lessen the possibility of the span-wise accumulation at critical points. It was pointed out that an accretion indicator was needed to prevent the accumulation of too heavy ice formations which would stall the action of the boot. He mentioned a present method for overcoming this difficulty – by increasing engine rpm thereby increasing the pressure supplied by the air pumps.

After a brief intermission, Mr. McBrien presented additional photographs showing the installation of rubber de-icer fluid feed shoes for propeller blades. He stated that this development was still in the experimental stage but that feed shoes of 30 in. in length were most satisfactory on the DC-3 transport. Severe chafing of the rubber was found to exist where these shoes were carried to greater distances toward the tip, he reported.

Mr. McBrien showed illustrations of heavy ice accumulation on the pitot mast but explained that this problem was now taken care of. The final photograph which he presented showed the installation of an Acrotorque-powered windshield wiper. He answered questions as to its effectiveness by pointing out that the ½-hp motor was not powerful enough to clear the windshield of ice and that it was evident that a large amount of power would be necessary, particularly with regard to the glaze ice.

JOINT SESSION

J. T. Gray, *Chairman*

Development of the "Ercoupe," an easy-to-fly two-place airplane that is free from stalling or spinning difficulties, was unfolded step by step before capacity attendance at this session, and the role of this type of plane in pilot training was explained. In the other half of the program, engine men discussed an exhaustive survey of current problems in light airplane engines, presented by a CAA official.

Development of the Ercoupe, an Airplane for Simplified Private Flying – FRED E. WEICK, chief engineer, Engineering & Research Corp.

DEVELOPMENT of a two-place airplane particularly suited to the needs of the private flyer was the aim of the design of the "Ercoupe," Mr. Weick pointed out. This was done, he explained, by making it unusually simple and easy to fly, quick to learn to fly, and free from the difficulties associated with stalling and spinning; it was also to have a good field of view for the pilot, and a cruising speed of 100 mph with a low-powered engine.

The development of such a plane began ten years ago, Mr. Weick reported, when a small group of engineers at the NACA Laboratories at Langley Field started a private study that resulted in the construction of the W-1 and W-1A experimental airplanes having the following unconventional features:

1. The tricycle landing gear with castering nose wheel, steerable if desired.
2. Suitable longitudinal and lateral stability with definitely limited upward elevator travel to prevent loss of control due to stalling and spinning.
3. A glide-control flap.
4. Two-control operation using pitching and rolling controls.

The stable, long-travel, three-wheel landing-gear arrangement, Mr. Weick contended, enables satisfactory landings to be made almost regardless of the wind direction, the air speed at contact, or the manner in which the airplane is flared at contact or guided to the ground; the glide-control flap is helpful in enabling an unskilled pilot to approach and make contact at a desired point; and elimination of rudder control is a definite stride toward reducing the skill, training, practice, and keenness required to fly safely.

The problem in the case of the Ercoupe, he pointed out, was to produce a salable low-powered airplane of good performance and attractive appearance that incorporated the ease of handling and other special characteristics that had been developed in the previous experimental planes. Characteristics of the final design provided with a 65-hp Continental motor were obtained, he brought out, by a long succession of flight tests, modifications, and more flight tests.

In the remainder of his presentation, Mr. Weick described some of the trials and the changes that have been made in the design in order to obtain the flying and handling qualities desired. He explained that the changes have been made both as a result of his company's experience and as a result of the "as-yet-limited" experience of the users of the airplane.

Discussion

Highlights of the research program on pilot training being carried out by the Civil

Aeronautics Administration, in which the "Ercoupe" is being used, were given in prepared discussion by J. H. Geisse, CAA. "Our objective is to find out how much reduction in pilot training time can be obtained by using a plane that is easier to fly, such as the Ercoupe, as compared with use only of conventional training planes," he explained. He pointed out also that Mr. Hinckley, Assistant Secretary of Commerce, and other members of the Civil Aeronautics Board have long been interested in fostering the development of greater safety in private airplanes as a means of improving the accident record of private flying. He showed that the application of training time requirements set up for reasonably safe operation of conventional aircraft, to one who purchased the "easier-to-fly" airplane, deprived that individual of part of the benefits that he might reasonably expect to derive from such a purpose. Data from this study show, he reported, that the actual time required to solo the Ercoupe was from 21.4 to 50.4% less than the time necessary to learn to solo conventional planes. Further data indicated that the total average time necessary to learn to solo conventional private planes by students who had first learned to solo the Ercoupe was 37 hr 47 min. Since this overall time is less than the average for students who are taught to solo in the conventional planes alone, he branded as false contentions that training on "easier-to-fly" planes would be worse than useless because it was "improper" training and that it would take longer to break a student, so trained, of the "bad habits" that he had formed than it would to train a new one in the "correct" manner of flying.

To conclude the session, Chairman Gray quoted statistics that showed that the total production of civil aircraft in the United States in 1940 exceeded 6000 – greater than the total U. S. production of military planes for that year. He conceded, however, that the tables would be turned in 1941.

Some Present-Day Problems in Light Airplane Engines – RALPH S. WHITE, acting chief, Powerplant Unit, Aircraft Airworthiness Section, Civil Aeronautics Administration.

THIS survey of current problems in light aircraft engines, Mr. White declared, really establishes the position of the 4-cyl horizontal-opposed aircooled aircraft engine, which type comprises over 90% of all aircraft engines under 100 hp manufactured since 1935. It is hoped, he continued, that this position will act as a stimulus for greater improvement of this type along the following lines: better visibility, better take-off performance, foolproof devices, reduction in noise, propeller gearbox reduction, metal propellers, controllable-pitch metal and wood propellers, vibration damping equipment, oil filters, air cleaners, automatic heat and mixture control for carburetors, and automatic heat control for oil.

Among the statistics of the private flying operation from 1936-1940 presented by Mr. White, are charts representing the results of the analysis and studies made by the CAA as to the causes of all powerplant failures on aircraft equipped with this type of light airplane engine. He also explained the method of investigating, tabulating, analyzing, and instigating corrective action.

In a detailed discussion of a persistently chronic and aggravating problem – idling difficulties in flight – he emphasized the danger of slow idling; and the necessity for checking idling speeds frequently, for gunning the engine during glides, and for keeping the carburetor heated.

The importance of the educational approach that must be applied in the handling of the manifold problems as they pertain to the pilot, the airplane and airplane-engine manufacturers, and the personnel of the Civil Aeronautics Administration, was stressed by the speaker. Additional service problems, such as replacement parts, icing, automobile fuel, overhaul, vibration, noise, detonation, and starting, also were treated in Mr. White's presentation.

"The record is good," he concluded, "but constantly improving standards of safety seem to be required to maintain this record."

Discussion

Speaking as one of the "little three" light aircraft engine manufacturers, Carl T. Doman, Aircooled Motors Corp., charged that instructors give little information to students on icing as private plane operators evidently do not understand how ice is formed. Civil airplanes, in his opinion, are designed to accommodate too many makes of engine; it would be better, he declared, if the manufacturers would concentrate on one engine for each model of plane. None of our engines, he declared, is approved today for use with automotive fuel. Referring to Mr. White's remarks about the amount of the time that private plane pilots operate their engines at part throttle, he declared: "We find that there are only two throttle positions – idling and wide open." One important point that must be faced, he emphasized, is cost. "To Bill Stout's specification of '100 hp – 100 lb – $100,'" he concluded, "should be added 100 years, although we do hope to make 100 a day before that."

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Feb. 15, 1941, and March 15, 1941.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section

Richardson, James Arthur, Jr. (A) aid to superintendent of transportation, Consolidated Gas, Electric Light & Power Co. of Baltimore, Baltimore.

Steele, David R. (M) owner, Fallsway Spring Service, Fallsway & Centre Sts., Baltimore.

Canadian Section

Duviner, Irwin (A) traffic manager, George Weston, Ltd., 134 Peter St., Toronto, Ontario.

Edgar, John Stanley (J) Thompson Products, Inc., St. Catharines, Ontario.

Chicago Section

Raffay, Andrew, Jr. (M) equipment sales engineer, Purolator Products, Inc., 365 Frelinghuysen Ave., Newark, N. J. (mail) Lake Shore Club of Chicago, 850 Lake Shore Drive, Chicago.

Rouse, Ceylon (J) student engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind. (mail) 722 34th St.

Wetzel, Paul W. (J) junior designer, Buda Co., Harvey, Ill. (mail) 10331 S. Eberhart Ave., Chicago.

Cleveland Section

Bouchez, S. J. (M) experimental test & development, Hercules Motors Corp., Canton, O. (mail) 864 16th, N. E., Massillon, O.

Burns, Louis G. (J) project engineer, Pump Engrg. Service Corp., Division of Borg-Warner Corp., 12910 Taft Ave., East Cleveland, O. (mail) 56 Wood St., Willoughby, O.

Csaszar, Steve (J) permanent mold die & piston designer, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland.

Jancsi, Julius Alan (J) draftsman, Pump Engrg. Service Corp., 12910 Taft Ave., Cleveland (mail) 3427 W. 49th St.

Kowaluk, Steve P. (J) foreman, Pump Engrg. Service Corp., 12910 Taft Ave., Cleveland (mail) 13212 Superior Rd., Suite No. 9.

Krider, John P. (J) machinist, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland (mail) 6402 Cedar Ave.

Lester, Nathan (M) president, Lester Engrg. Co., 2711 Church Ave., Cleveland.

Lundberg, Robert (A) draftsman, Pump Engrg. Service Corp., 12910 Taft Ave., Cleveland (mail) 984 Elbon Rd.

Rule, Frank M. (J) sales engineer, National Bronze & Aluminum Foundry Co., Cleveland (mail) 148 E. Bagley Rd., Berea, O.

Thayer, Lee E. (J) experimental test, Hercules Motors Corp., Canton, O. (mail) 830 10th St., N. W.

Ugrob, Jack (J) designer, Pump Engrg. Service Corp., Cleveland (mail) 3248 W. 130th St.

Willis, Eldrich J. (J) aircraft engineer, Aluminum Co. of America, 2210 Harvard Ave., Cleveland (mail) 99 Ellenwood Ave., Bedford, O.

Yoger, Frank, Jr. (J) mechanical draftsman, Pump Engrg. Service Corp., Cleveland (mail) 19300 Meredith Ave., Euclid, O.

Dayton Section

Cotterill, Donald M. (A) assistant supervisor, transportation, Dayton Power & Light Co., 25 N. Main St., Dayton.

Whittlesey, David Walter (J) junior mechanical engineer, U. S. Army, Air Corps, Materiel Division, Wright Field, Dayton (mail) 121 Hadley Ave.

Detroit Section

Adams, Robert L. (J) engineer, Barnes-Gibson-Raymond Division, Associated Spring Corp., 6400 Miller Ave., Detroit.

Barr, Harry F. (M) supervisor, engine laboratory, Cadillac Motor Car Division, General Motors Corp., Detroit (mail) 15429 Indiana.

Cuskie, Herman C. (J) junior engineer,

Chrysler Corp., Highland Park, Mich. (mail) 720 Knox St., Birmingham, Mich.

Dowlding, Wm. F. S. (J) methods engineer, Long Mfg. Division, Borg-Warner Corp., 12501 Dequindre, Detroit (mail) 17133 Pinehurst Ave.

Felder, Howard B. (J) junior engineer, Research Laboratories Division of General Motors Corp., Room 11-162, 485 W. Milwaukee Ave., Detroit.

Hawthorne, Eugene P. (J) field engineer, Budd Wheel Co., 12141 Charlevoix Ave., Detroit.

Hopper, William James (J) draftsman, Yellow Truck & Coach Mfg. Co., Pontiac, Mich. (mail) 168 S. Edith St.

Knibbe, Klaas (M) 1117 Lakepointe, Grosse Pointe, Mich.

Lawson, Seward N. (A) partner, Moore Laboratories, Detroit (mail) 3230 Pembroke Ave.

Savage, Clyde L. (M) design engineer, Continental Aviation & Engrg. Corp., Detroit (mail) 761 Chalmers Ave.

Wozniak, Frank B. (J) stress analyst, Stout Skycraft Corp., 2124 S. Telegraph Rd., Dearborn, Mich. (mail) 7144 W. Warren Ave., Detroit.

Indiana Section

Benjamin, Walter E. (A) sales & development engineer, Pierce Governor Co., Anderson, Ind.

Conron, Thomas Wm., Jr. (J) tool designer, Chevrolet Muncie Division, General Motors Corp., Muncie, Ind. (mail) 401 N. Calvert Ave.

Houghton, Carl R. (M) chief engineer, Roots-Connersville Blower Corp., Connersville, Ind.

Miller, Maurice Henry (J) engineer, L.G.S. Spring Clutches, Inc., 1701 Gent Ave., Indianapolis.

Stallwood, Charles (M) metallurgist, Allison Division, General Motors Corp., Indianapolis (mail) 5123 W. 15th St.

Troyer, Melville R. (J) blue printer, Chevrolet-Muncie Division, General Motors Corp., Muncie, Ind. (mail) 401 N. Calvert Ave.

Metropolitan Section

Arias, Antonio, Jr. (J) drafting, designing, International-Plainfield Motor Co., Plainfield, N. J. (mail) 403 E. Seventh St.

Behney, Edward J. (J) Electric Boat Co., Elco Naval Division, Bayonne, N. J.

Carrigan, Carlton E. (M) metallurgist, Ranger Aircraft Engines Division, Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

Cicchetti, Eugene Gildo (J) engine draftsman, Breeze Corporations, Inc., 21 S. Sixth St., Newark, N. J. (mail) 972 Sherman Ave., New York City.

Clark, Robert H. (M) general superintendent, transportation, Consolidated Edison Co. of N. Y., Inc., Room 1004, 4 Irving Place, New York City.

Close, Walter Laird (J) experimental test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 54 Riversedge Rd., Mountain View, N. J.

Fraas, Arthur P. (J) test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 185 E. 31st St.

Kelley, Albert Charles (J) tool designer, Breeze Corporations, Inc., 24 S. Sixth St., Newark, N. J. (mail) 334 Springdale Ave., East Orange, N. J.

Last, Bernard (J) junior engineer, gear design, Mack Mfg. Corp., New Brunswick, N. J. (mail) 2105 Walton Ave., New York City.

Perry, Millard Fillmore (J) engineer, Curtiss Propeller Division, Curtiss-Wright Corp., Clifton, N. J. (mail) General Delivery, Caldwell, N. J.

Ritchen, Ralph (A) associate editor, book department, MoToR, 572 Madison Ave., New York City (mail) 2440 Amsterdam Ave.

Rowe, M. Robert (J) junior engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 117 Market St., West Englewood, N. J.

Short, Joseph V. (M) engineer, Standard-Vacuum Oil Co., 26 Broadway, New York City.

Siltanen, John Carl (J) aeronautical engineer, Brewster Aeronautical Corp., Long Island City, N. Y. (mail) 7200 Ridge Blvd., Apt. 778, Brooklyn, N. Y.

Speiser, William Z., Jr. (A) salvage inspector, Plant 3, Fairlawn, Wright Aeronautical Corp., Paterson, N. J. (mail) 307 E. 21st St.

Sturtevant, Eric Albert (A) general manager, Sturtevant Co., 1023 E. 176th St., New York City.

Van Winkle, Marshall, Jr. (A) president, American Marsden Co.; Place Cap Screw & Bolt Co., 1 Exchange Place, Jersey City, N. J.

Vermeulen, John A. (J) assistant supervisor, experimental test laboratory, Wright Aeronautical Corp., Beckwith Ave., Paterson, N. J. (mail) 74 Church St., Haledon, N. J.

Milwaukee Section

Denning, Loren George (J) engine tester, Sinclair Refining Co., East Chicago, Ind. (mail) Thiensville P. O., R. I., Mequon, Wis.

Pierson, John Edward (J) engineer, Twin Disc Clutch Co., 1328 Racine St., Racine, Wis. (mail) 1009 Hayes Ave.

New England Section

Herscovitz, Harold, Sgt. (A) U. S. Army, 180th Field Artillery, Battery C, Camp Edwards, Bourne, Mass.

Northern California Section

Brown, Avon (A) draftsman, Hall-Scott Motor Car Co., Berkeley, Calif. (mail) 1243 Evelyn Ave.

Lane, John T. (A) plant superintendent, Coca-Cola Bottling Co. of Calif., 1301 17th St., San Francisco.

Northwest Section

Bryant, Paul Murray (J) draftsman, Boeing Aircraft Co., Seattle, Wash. (mail) 410 N. Harvard Ave.

Quitslund, Phelps G. (A) owner, Quitslund Body Co., 825 Taylor Ave., Seattle, Wash.

Oregon Section

Beverly, H. L. (A) sales engineer, Standard Oil Co. of California, Post Office Box 950, Pacific Bldg., Portland, Ore. (mail) 215 N. W. 22nd Place.

Mitchoff, J. J. (A) body shop foreman, Wentworth & Irwin, Inc., 1005 W. Burnside, Portland, Ore.

Smith, Britt M. (J) chief engineer, Yates Aircraft Corp., Bernard's Airport, Beaverton, Ore.

Philadelphia Section

Albert, Watson N. (A) superintendent, motor equipment, Philadelphia Toilet & Laundry Co., Inc., Philadelphia (mail) 928 Winter St.

Bruce, Donald S. (A) division chief, Johns-Manville Corp., Research Laboratories, Manville, N. J.

Cooper, Laurence (J) special designing engineer, Autocar Co., Ardmore, Pa. (mail) 117 Walnut Ave., Wayne, Pa.

Feld, Robert Tillman (J) junior automotive engineer, Socony-Vacuum Oil Co., Inc., Research & Development Division, Paulsboro, N. J.

Hughes, Maurice L. (A) automotive engineer, Sun Oil Co., 1608 Walnut St., Philadelphia (mail) 54 Reiffs Mill Rd., Ambler, Pa.

St. Louis Section

Rhoads, Waldon Rice (M) layout draftsman, Curtiss-Wright Corp., Robertson, Mo. (mail) 617 Wesley, Ferguson, Mo.

Roever, Frederick H. (M) superintendent, Aeronautical Engineering & Executive Schools, Parks Air College, Parks Airport, East St. Louis, Ill.

Southern California Section

Cipolla, Joseph A. (J) engineer in training, Ethyl Gasoline Corp., 723 E. Milwaukee Ave., Detroit (mail) 540 19th St., San Bernardino, Calif.

Fisk, Edwin M. (M) chief engineer, Fisk Airplane & Engine Co., Mission San Jose, Calif.

James, William Judson (J) tool designer, Lockheed Aircraft Corp., Burbank, Calif. (mail) 614 Gramercy Place, Los Angeles.

Levy, Charles N. (J) stress analyst, Timm Aircraft Co., Metropolitan Airport, Van Nuys, Calif. (mail) 250 S. Kenmore Ave., Apt. 400, Los Angeles.

Misner, James B. (J) standards engineer, Hughes Aircraft Co., Hangar 3, Union Air Terminal, Burbank, Calif. (mail) 12546 Mitchell Ave., Venice, Calif.

Murawsky, Henry (M) layout man, North American Aviation, Inc., Inglewood, Calif. (mail) 1646 S. Sherbourne Drive, Los Angeles.

Nelson, Henry O'Dell (M) associate aeronautical engineer, U. S. Naval Air Station, San Diego, Calif. (mail) 1561 Catalina Blvd., San Diego, Calif.

Nylund, John Homer (J) engineer, Lockheed Aircraft Corp., Burbank, Calif. (mail) 4910 Ninth Ave., Los Angeles.

Price, Nathan C. (M) consulting engineer, Lockheed Aircraft Corp., Burbank, Calif. (mail) 3116 Lake Hollywood Drive, Hollywood, Calif.

Reynolds, Larry (A) manager, truck & commercial department, Al Stuebing Hollywood Ford Dealer, 1748 Cahuenga Blvd., Hollywood, Calif.

Snyder, Lee G. (M) Ensign, U.S.N.R., Vega Aircraft Co., Burbank, Calif. (mail) 6124 Glen Holly, Hollywood, Calif.

Webb, Harold E. (M) executive assistant to president & sales engineer, Adel Precision Products Corp., Burbank, Calif. (mail) 802 N. Griffith Park Drive.

Whittlesey, James W. (J) engineer, Kinner Motors, Inc., 635 W. Colorado, Glendale, Calif. (mail) 1645 Rose Villa St., Pasadena, Calif.

Southern New England Section

Andreini, Geno J. (J) experimental test engineer, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. (mail) 896 Asylum Ave., Hartford, Conn.

Burroughs, Richard Hansford, Jr. (J) aerodynamic & flight test engineer, Vought-Sikorsky Aircraft, Stratford, Conn. (mail) 974 Broad St.

DeSilva, Harry R. (S M) associate professor, psychology, Yale University, 333 Cedar St., New Haven, Conn.

McGaw, William Livingston, Jr. (J) experimental test engineer, Pratt & Whitney Aircraft, Division of United Aircraft Corp., East Hartford, Conn. (mail) 62 Maplewood Ave.

Waite, David E. (M) sales engineer, Wallace Barnes Co., Bristol, Conn.

Syracuse Section

Carnahan, O. A. (M) professor, mechanical engineering, Syracuse University, College of Applied Science, Syracuse, N. Y.

Washington Section

Coxe, Keith E. (J) junior mechanical engineer, National Advisory Committee for Aeronautics, Langley Field, Hampton, Va. (mail) 197 Melrose Ave.

Czyzak, Stanley J., 2nd Lieut. (J) U. S. Army, Ordnance Department, Washington (mail) 220 S. E. Eighth St.

Kottas, Harry (S M) assistant engineer, National Advisory Committee for Aeronautics, Langley Field, Hampton, Va. (mail) 301 Victoria Ave.

Manganiello, Eugene J. (S M) assistant mechanical engineer, National Advisory Committee for Aeronautics, Langley Field, Hampton, Va. (mail) 55 Cherokee Rd.

Nichols, De Owen, Jr., 1st Lieut. (J) engine specialist, U. S. Army, Office, Chief of Ordnance, Technical Staff, Automotive Section, Washington.

Outside of Section Territory

Adams, Lee Francis (M) assistant to vice-president, manager, standards department, General Electric Co., 1 River Road, Schenectady, N. Y.

Fuller, Paul W. (M) chief engineer, Fitz-John Coach Co., Muskegon, Mich. (mail) 1640 Fifth St.

Hull, Dale O. (J) automotive engineer, Standard Oil Co. (Ind.), Mason City, Iowa (mail) 306 N. Third St., Clear Lake, Iowa.

Knott, Kenneth E. (A) factory engineer, Kawneer Co., Niles, Mich. (mail) R. R. No. 4.

Leeper, W. T. (A) vice-president, charge of sales, Bayou State Oil Corp., Shreveport, La. (mail) P. O. Box 1514.

Patras, Floyd (M) manager of maintenance, Southwestern Greyhound Lines, Inc., 905 Commerce, Fort Worth, Tex. (mail) 908 Cadiz St., Dallas, Tex.

Rosenlund, Iver Theodore (J) mechanical engineer, Texas Co., Beacon Research Laboratories, Glenham, N. Y.

Sheard, Harry J. (M) refinery manager, Bayou State Oil Corp., Shreveport, La. (mail) P. O. Box 106, Hosston, La.

Wilson, G. C. (M) lubrication engineer, Sinclair Refining Co., 630 Fifth Ave., New York City (mail) 1712 Abercorn St., Savannah, Ga.

Foreign

Bohm, John Richard Fulton (A) fieldman, United Motor Products Co., Division of General Motors New Zealand, Ltd., Box 1621, Wellington, New Zealand.

Edwards, R. M. (F M) director, factory manager, Leggett Products, Pty., Ltd., Doonside St., Richmond, Victoria, Australia.

Lessing, Otto (M) technical service manager, West India Oil Co., S. A., Post Office Box 5039, Ancon, Canal Zone.

Moore, Horace Edward (F M) production manager, engine division, Commonwealth Aircraft Corp., Pty., Ltd., Fishermen's Bend, Melbourne, Australia (mail) 37 Shoobra Rd., Elsternwick.

Tripp, Edwin C. III (J) apprentice engineer, Pan American-Grace Airways, Inc., Limatambo Airport, Lima, Peru.

Wooff, Herbert (F M) managing director, Wooff & Salvesen, Ltd., 32-34 Lichfield St., Christchurch, New Zealand.

APPLICATIONS Received

The applications for membership received between Feb. 15, 1941, and March 15, 1941, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section

Christmas, John Kay, Major, U. S. Army, Ordnance Department, Aberdeen Proving Ground, Md.

Staiger, Lea R., 1st Lieutenant, Quartermaster Motor Transport School, Holabird Q. M. Depot, Baltimore.

Buffalo Section

Sylvester, H. M., secretary and treasurer, F. A. Smith Mfg. Co., Inc., Rochester, N. Y.

Canadian Section

Loughrey, Frank Garfield, transportation manager, Purity Baking Co., Ltd., Toronto, Ont., Canada.

Parks, Arthur Clemens, engineer, McKinnon Industries, Ltd., St. Catharines, Ont., Canada.

Chicago Section

Baumler, J. O., division head, General Traffic Department, Sears, Roebuck & Co., Chicago.

Bobbish, Michael George, lubrication salesman, Macmillan Petroleum Corp., Chicago.

Churchill, H. E., assistant research engineer, Studebaker Corp., South Bend, Ind.

Figlewski, Benjamin, dynamometer engineer, Sinclair Refining Co., East Chicago, Ind.

Schultz, Harold B., junior designer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Shaw, Raymond, president, The Chek-Chart Corp., Chicago.

Whitehead, Willard J., assistant chief engineer, Woodward Governor Co., Rockford, Ill.

Wojtasik, E., automotive engineer, Sinclair Refining Co., East Chicago, Ind.

Cleveland Section

Dallow, Thomas Peter, draftsman, Thompson Products, Inc., Cleveland.

Henderson, Lester J., assistant manager, Aviation Division, The Weatherhead Co., Cleveland.

Prince, Warren V., tool development engineer, Thompson Products, Inc., Cleveland.

Shiverick, Asa, Jr., production manager, Thompson Products, Inc., Cleveland.

Walter, Robert J., designing engineer, Twin Coach Co., Kent, Ohio.

Dayton Section

Cooper, Guy, instructor, Ohio State University, Columbus, Ohio.

Detroit Section

Babcock, Charles W., consulting engineer, 1120 Detroit Bank Bldg., Detroit.

Barit, Robert, purchasing department, Hudson Motor Car Co., Detroit.

Dickenshied, Richard H., junior engineer, Packard Motor Car Co., Detroit.

Jones, Robert Ralph, assistant to metallurgist, Thompson Products, Inc., Detroit.

Kopec, Casimir S., junior research engineer, General Motors Corp., Research Laboratories, Detroit.

Koppinger, Nicholas G., tool engineer, Briggs Manufacturing Co., Detroit.

Mann, William, engineer, Budd Wheel Co., Detroit.

Marquis, D. P., metallurgist, Thompson Products, Inc., Detroit.

Nielson, T. O., sales representative, Budd Wheel Co., Detroit.

Punke, J. J., development engineer, Precision Castings Co., Inc., Detroit.

Redinger, John, Jr., assistant to metallurgist, Thompson Products, Inc., Detroit.

Reed, Howard G., designer, Packard Motor Car Co., Detroit.

Segall, Amelius B., research engineer, Detroit Aluminum & Brass Corp., Detroit.

Strickland, Harold A., Jr., electrical development engineer, Budd Wheel Co., Detroit.

Strickland, Randolph L., research engineer, Detroit Aluminum & Brass Corp., Detroit.

Toot, David F., engineer, Chrysler Corp., Highland Park, Mich.

Windeler, Edmund Lee, report writer, Pontiac Motor Division, General Motors Corp., Pontiac, Mich.

Wolcott, Chester M., metallurgical engineer, Ohio Seamless Tube Co., Detroit.

Indiana Section

Bradshaw, Theron, service manager, The Perfect Circle Co., Hagerstown, Ind.

Boese, Harry L., plant superintendent, Merz Engineering Co., Indianapolis.

Evans, Robert, chief tool designer, Wallace Tool & Die Co., Indianapolis.

McNeely, Edward Charles, tool engineer, Merz Engineering Co., Indianapolis.

Mull, John W., Jr., owner, J. W. Mull, Jr., 333 N. Pennsylvania St., Indianapolis.

Nye, B. B., test engineer, Allison Division, General Motors Corp., Indianapolis.

Powell, William S., tool engineer, Merz Engineering Co., Indianapolis.

Renno, D. G., body engineer, International Harvester Co., Inc., Fort Wayne, Ind.

Rice, Raymond Wilford, manager, Quality Tool & Die Co., Indianapolis.

Stassus, George A., tool estimator, Merz Engineering Co., Indianapolis.

Terry, Vincent A., plant survey, Merz Engineering Co., Indianapolis.

van Schwartz, Zolly Carlton, chief precision department, Merz Engineering Co., Indianapolis.

Wallace, Alvie T., manager, Wallace Tool & Die Co., Indianapolis.

Watson, Samuel Robert, machine designer, Merz Engineering Co., Indianapolis.

Weidman, Stanley R., chief tool engineer, Merz Engineering Co., Indianapolis.

Metropolitan Section

DeBard, Edward F., engine operator, Socony-Vacuum Oil Co., Inc., Brooklyn, N. Y.

Hirsch, Kenneth W., designer and checker, Breeze Corporations, Inc., Newark, N. J.

Jaqua, George Remig, engineer in plant engineering department, Wright Aeronautical Corp., Paterson, N. J.

Lawrence, Kenneth Van Wart, automotive work, Tide Water Associated Oil Co., New York.

Lawrence, William Camp, assistant chief engineer, American Airlines, Inc., Jackson Heights, L. I., N. Y.

Loos, Robert Alexander, junior test engineer, Wright Aeronautical Corp., Paterson, N. J.

Mondschein, Joseph, draftsman, Breeze Corporations, Inc., Newark, N. J.

Myers, Finley B., supervision Co. cars, C. I. T. Corporation, New York.

Peenstra, Abram G., instructor, Stewart Technical School, New York.

Saladino, George P., service manager, Manhattan Pontiac Corp., New York.

Smith, Van Dorn C., sales department, Oakite Products, Inc., New York.

Ziegler, Walter Herbert, junior engineer, Wright Aeronautical Corp., Paterson, N. J.

Milwaukee Section

Lukey, John Bernard, machine design engineer, Kearney & Trecker Corp., West Allis, Wis.

New England Section

Nelson, Clarence O., field engineer, General Electric Co., Lynn, Mass.

Woodward, Alan H., service man, Atlas Imperial Diesel Engine Co., New Bedford, Mass.

Northwest Section

Kasper, Rudolph Howard, chief inspector, Kenworth Motor Truck Corp., Seattle, Wash.

Oregon Section

Bourne, John P., superintendent, industrial lubrication sales, Standard Oil Co. of Calif., Portland, Oregon.

Philadelphia Section

Ambler, John D., engineer, Auto Engineering & Machine Co., Philadelphia.

Ambler, William S., Jr., engineer, Auto Engineering & Machine Co., Philadelphia.

Blair, John I., chief engineer, Worthington Mower Co., Stroudsburg, Pa.

Hirtreiter, Arthur B., automotive engineer, Mack Mfg. Co., Allentown, Pa.

Ramsey, Robert P., executive engineer, The National Supply Co., Philadelphia.

Russek, Joseph E., Jr., layout draftsman, Bellanca Aircraft Corp., Newcastle, Del.

Pittsburgh Section

Elliott, M. A., gas engineer, U. S. Bureau of Mines, Pittsburgh.

Lewis, Caryl Clyde, factory manager, Bendix Westinghouse Automotive Air Brake Co., Pittsburgh.

Rothpletz, Byron, supervisor auto maintenance, The Atlantic Refining Co., Philadelphia, Pa. Mail: 5733 Butler St., Pittsburgh.

St. Louis Section

Lundberg, Russell, district supervisor, National City Lines, Inc., Chicago, Ill. Mail: 1035 South Second St., Springfield, Ill.

Southern California Section

Barickman, Harold Gilbert, liaison engineer, Lockheed Aircraft Corp., Burbank, Calif.

Hearne, T. P., standards engineer, Ryan Aeronautical Co., Lindbergh Field, San Diego, Calif.

Hubbard, William Deane, learner, weight control engineer, Lockheed Aircraft Corp., Burbank, Calif.

Johnson, Clarence L., chief research engineer, Lockheed Aircraft Corp., Burbank, Calif.

Kimball, John B., assistant project engineer, Vultee Aircraft, Inc., Downey, Calif.

Kramer, Al, power plant engineer, Douglas Aircraft Co., Inc., Santa Monica, Calif.

McClarren, Don, engineer, Consolidated Aircraft Corp., San Diego, Calif.

Nylin, Nels E., plant engineer, Lockheed Aircraft Corp., Burbank, Calif.

Paradiso, Michael Antonio, liaison engineer, Douglas Aircraft Co., Inc., Santa Monica, Calif.

Wiener, Norton, test engineer, Menasco Mfg. Co., Burbank, Calif.

Southern New England Section

Abild, Robert Noble, draftsman, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

Brown, Elmer L., engineer, Socony-Vacuum Oil Co., Inc., New Haven, Conn.

Rand, Abbott F., assistant engine tester, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

Washington Section

Harris, G. B., automotive engineer, U. S. Civilian Conservation Corps, Washington, D. C.

Jobin, Robert J., Jr., clerk, U. S. Department of Agriculture, Washington, D. C.

Smith, Francis George, technical lubricating engineer, American Oil Co., Richmond, Va.

Outside of Section Territory

Duguid, John G., designing engineer, Office, Engineering Division, Panama Canal, Balboa Heights, Canal Zone.

Farley, T. R., vice president, Caterpillar Tractor Co., Peoria, Ill.

Scheumann, Walter W., chief chemist, Refining Division, Cities Service Oil Co., Bartlesville, Okla.

Searle, Thomas Charles, tool designer, Merz Engineering Co., Indianapolis, Ind. Mail: Curtis Road, Fountain City, Tenn.

Foreign

Hutchison, Robert, works manager and chief engineer, Port Elizabeth Electric Tramway Co., Ltd., Port Elizabeth, South Africa.

About Authors

(*Concluded from page 13*)

research work on the utilization of gasolines in automobiles, with the idea of securing a better fitting together of fuel and engine. He is a graduate of M.I.T., as is Mr. Campbell, who has concentrated his work at GM Research Laboratories on detonation, methods of eliminating it, and ways of measuring its magnitude. In this connection he was active in the CFR tests at San Bernardino last year.

▪ *Since* **RALPH N. DuBOIS** *(M '25) presented "Altitude Performance of High-Output Engines" at the 1940 SAE Summer Meeting, he has given up his post as project engineer with the Lycoming Division of Aviation Mfg. Corp. to become executive engineer, Aircraft Division, Packard Motor Car Co. Aviation has been Mr. DuBois' chief interest since his graduation from the U. of Michigan with his B.S.E. degree in 1922. He held posts with the Bureau of Standards, A.C. Spark Plug Co., and Continental Aircraft Engine Co., where he was assistant chief engineer, before joining Lycoming. Active in the SAE, he was vice president of the Society representing Aircraft-Engine Engineering in 1938, has held offices in the Washington and Detroit Sections, and is now engaged in the work of several SAE technical committees.*

▪ **E. A. ROBERTS** *(Aff. Rep. '37), whose paper "Designing the Tire for the Car," was published in June, 1939, sheds some light in this issue on development of wide-rim tires. In his position as passenger-car tire development engineer for the Firestone Tire & Rubber Co., Mr. Roberts works closely with automobile manufacturers in finding answers to their tire problems. Development of tires for airplanes and racing cars is another phase of his work. He has been affiliated with the development department of Firestone since shortly after his graduation from Ohio Wesleyan University in 1924.*

▪ **P. C. SANDRETTO** *started in the radio industry as a broadcasting station engineer from 1925 to 1930. He next joined the technical staff of Bell Telephone Laboratories, specializing in aeronautical radio. This led to his post as communications engineer for United Air Lines (1932-1938) and his present capacity as superintendent of United's Communications Laboratory. The laboratory has as its purpose the design, development and procurement of radio and electrical systems for aircraft and ground stations. Mr. Sandretto was a member of the Bureau of Air Commerce subcommittee on alternating current power supply for aircraft, and has conducted extensive work and published papers on the subject of a-c power supplies for aircraft. He was graduated in 1930 from Purdue University with the degree of B.S.E.E., and received the degree of Electrical Engineer from the same school in 1938.*

NEWS OF SOCIETY

(*Continued from page 21*)

shapers, obtaining more cuts per minute than with mechanical drives; gear and cam grinders; broaches; die sinkers; gun borers; fire ladders; and trucks for handling materials, where the lifting is done hydraulically and the truck is driven by hydraulic means, as well.

Tells of Substitutes For Needed War Metals

▪ Dayton

Antimony, manganese, chromium, tungsten, tin, mercury and nickel were listed as strategic metals – metals needed for war purposes and not available in this country in sufficient quantity, by H. W. Gillett, speaker at the Dayton Section's Feb. 17 meeting.

Dr. Gillett, who is chief technical adviser at the Battelle Memorial Institute, analyzed the degree of America's need for these metals. He also told of steps bieng taken to overcome our deficiencies – development of ersatz materials and substitution of other metals, as well as bringing into use low-grade domestic supplies, and development of "stock-piles."

His paper, titled "Made in America Substitutes," was presented at the 1941 SAE Annual Meeting, and a comprehensive digest of its contents appeared on page 24 of the February SAE JOURNAL.

National Officers Visit Baltimore and Pittsburgh

SAE President A. T. Colwell's March visits to the Baltimore and Pittsburgh Sections brought to nine the SAE groups that he has addressed since taking office at the Society's Annual Meeting last January. Telling the story of "Behind the Scenes in National Defense," Mr. Colwell depicted the industry's rapid strides in readying the nation for any emergency, and spotlighted the SAE's important part in this activity as the technical "focal point" of the entire industry. Mr. Colwell's talks at the March meetings were based on his earlier presentations, reported on page 17 of the March SAE Journal.

Mr. Colwell was accompanied by SAE General Manager John A. C. Warner on his visits to the Baltimore and Pittsburgh Sections, as well as to most of the Sections visited in February. Mr. Warner, however, was forced to forego attendance at the February meetings of the Syracuse and Kansas City Sections because of SAE business in connection with the Society's national defense program.

▪ Chicago Celebrates

The national officers' visit to the Chicago Section, Feb. 25, coincided with the Section's celebration of its 25th Anniversary. Honored guests included SAE Past President Ralph R. Teetor and 13 of the Section's living past presidents. Observed Mr. Colwell: "We congratulate the Chicago Section upon its 25th Anniversary, and glance with pleasure back over a record of accomplishment. Changes in the automotive industry have been fast and sweeping in that period; the Chicago Section has kept its membership abreast of the times and has been helpful in many individual cases."

▪ Detroit's Welcome

On occasion of Messrs. Colwell's and Warner's attendance at the Detroit Section's Feb. 24 meeting, a reception, held in their honor, was attended by the entire governing board of the Section. Sharing the meeting program with Mr. Colwell was John Haien, director of Chrysler's Department of Tomorrow. Mr. Haien, who recently assisted in setting up Federal training programs for skilled mechanics throughout the nation, told intimate, off-the-record accounts of the Washington scene.

SAE Participates in Utility Fleet Forum

The SAE is cooperating with the Edison Electric Institute and the American Gas Association in a Spring Conference on Operation of Public Utility Motor Vehicles, sponsored by the Motor Vehicle Committee of the AGA. The dates are April 21 and 22; the place: William Penn Hotel, Pittsburgh.

A tentative schedule of sessions follows:

Monday, April 21

Morning – 10:00 A.M., *R. H. Clark, AGA, Presiding*

Application of Motor Transportation to the Gas Industry From the Operator's Viewpoint – *A. C. Cherry, Cincinnati Gas & Electric*

Application of Motor Transportation to the Gas Industry From the Transportation Supervisor's Viewpoint – *John M. Orr, Philadelphia Co.*

Luncheon, *R. H. Clark, AGA, Presiding*

Public Utilities in National Defense – *E. P. Durfee, Consolidated Edison Co.*

Afternoon – 2:30 P.M., *R. M. Cregar, Presiding*

Shop Methods for Improving Gasoline Economy – *Errol J. Gay, Ethyl Gasoline Corp.*

Afternoon – 4:30 P.M., Meeting of Committee on Operation of Public Utility Motor Vehicles

Tuesday, April 22

Morning – 10:00 A.M., *B.D. Connor, Presiding*

The Development of Body Design for Meter-Setters' Trucks – Both Gas and Electric – *N. P. Larson, Truck Engineering Co.*

Tuesday – 2:00 P.M. Closed meeting for public utility fleet operators only.

Chrysler Engineer Traces Fluid Drive Development

▪ New England

In bringing members of the New England Section up to date on the Chrysler fluid drive, A. E. Kimberly, at the Section's Feb. 18 meeting, reviewed its development as well as earlier industrial applications of the hydraulic coupling upon which it is based.

Mr. Kimberly, a member of Chrysler's engineering staff, told of the development work done in perfecting the drive, and the long series of tests before it was introduced to the public. Since it originally was offered as extra equipment on the Chrysler Imperial, he said, demand has enabled them to increase production and extend it to other Chrysler models, DeSoto and Dodge as standard or special equipment.

During the course of his presentation, Mr. Kimberly had shown a number of slides illustrating technical details of the unit. After his talk, he answered a barrage of questions until Section Chairman Joseph E. Noon called a halt after the speaker had been on his feet for nearly two and a half hours.

Engine Horsepower Up 51% in 10 Years

▪ Philadelphia
▪ New England

"Too many engineering problems have been left to the chemist to solve," R. J. S. Pigott, staff engineer, Gulf Research & Development Co., declared at the March 11 meeting of the New England Section and the Philadelphia Section's March 12 meeting.

Speaking on "Engine Design vs. Engine Lubrication," Mr. Pigott told his listeners that during the past ten years, engine horsepower has increased 51%. This increase, he added, is proportioned between increase of compression ratio, intake system, displacement and speed. Increase in severity of mechanical and thermal loading is due both to increase of rotative speed and brake mean effective pressure. Cooling done by the oil has been increased, and pistons are hotter than formerly, he said, noting also that crankcase temperatures have risen.

Mr. Pigott pointed out that compound oils do not eliminate the basic rate of change or deterioration of oil with temperature. Compounding delays the start of deterioration and lowers the absolute rate, he explained.

Several cases of lubrication difficulty were discussed, and Mr. Pigott described a method of analysis which shows accurately what any oil system will do, and which can locate most of the trouble. "The general fault nowadays," he said, "is too low an oil flow over the bearings for cooling and unnecessarily high crankcase temperatures."

Stating his belief that compound oils are bound to increase in the future, he added: "But, ultimately, each must cover a wider range of usefulness than any present single oil covers."

In concluding, Mr. Pigott briefly discussed a means of increasing brake horsepower without increasing the octane demand of the engine.

Mr. Pigott's paper was earlier presented at the 1941 SAE Annual Meeting, and will be published in full in the May issue of the SAE Journal.

▪ Philadelphia Discussion

Divergent opinions came to the fore when J. R. Sabina, chairman for the evening, called for discussion.

C. O. Guernsey, J. G. Brill Co., stated that he had used copper-lead bearings since 1927 – but that trouble didn't start until 15 months ago. The oil temperature is held to 200 F maximum, and no engine changes had been made just prior to the cold corrosion trouble. "We ain't the guys what did it!" he declared.

Answering, Mr. Pigott countered by reporting the experience of a fleet operator who traced his cold corrosion troubles to a cardboard filter cartridge that was sealed with sulfur. Mr. Guernsev reported that when his engines get past the 15,000-mile mark there is little difficulty; most of this trouble is with new and refitted engines.

Another discusser, W. F. Aug, Mack Mfg. Corp., recounted cold corrosion trouble with a gasoline engine, whereas none was experienced with a diesel of similar design. The excess air and less residual gases, characteristic of the diesel, give less water of condensation and may account for the diesel immunity, it was observed.

Adolf Gelpke defended the newer bearing alloys. There must be something to them, he said, if they hold up when increased compression ratio causes breakdown of babbitt. E. P. Gohn, Atlantic Refining Co., discussed bearing fatigue produced by journals being out of round. With modern hardened shafts (necessitated by the harder bearing alloys) it might now be possible to return to babbitt successfully, he opined.

C. M. Billings, Gulf Oil Corp.; Henry L. Brownback, consulting engineer; F. C. Burk, Atlantic Refining Co.; and C. H. Schlesman, Socony-Vacuum Oil Co., were among others participating in discussion of Mr. Pigott's paper.

Nutt Names Committees to Carry Out SAE Aircraft Assignments from OPM

ASSIGNMENT to the SAE by the Office of Production Management of responsibility for aeronautic standardization work on engines, propellers, materials and processes, and accessories and equipment has resulted in designation of final committee personnel to expedite further the extensive SAE accomplishments already recorded in several of these fields.

Past President Arthur Nutt, vice president of engineering, Wright Aeronautical Corp., will head the newly consolidated activities as chairman of an Aeronautics Division of the SAE Standards Committee. Serving with Mr. Nutt on this main division, under the direction of which subdivisions and their subcommittees will do the actual work of standardization, are Hall Hibbard, Lockheed Aircraft Corp.; L. S. Hobbs and Val Cronstedt, Pratt & Whitney Aircraft Division, United Aircraft Corp.; William Littlewood, American Airlines, Inc.; J. B. Johnson, U. S. Army Air Corps, Wright Field; and Erle Martin, Hamilton Standard Propellers, Division United Aircraft Corp.

As in the past, the SAE, in these newly defined aeronautic defense standards activities, will correlate its work closely with the Aeronautical Chamber of Commerce, the Aeronautical Board, the Civil Aeronautics Administration, and the National Aircraft Standards Committee. To this NASC group, composed of representatives of each of the aircraft manufacturing companies, the OPM has assigned responsibility for standardization having to do with airframes and for correlation of standardization work in connection with powerplant installations.

Val Cronstedt
Chairman, Aircraft-Engine Subdivision

These re-aligned SAE divisions and subdivisions will replace the tentatively established SAE Aeronautical Standards Board for National Defense.

Coincident with the announcement by Chairman Nutt of the new division and subdivision personnel, comes news of intensified effort in all four of the divisions in which the SAE has assignments.

Materials Group Carries On

The aircraft engine materials group, headed by B. Clements, Wright Aeronautical Corp., with 136 specifications in widespread use already to its credit, is accelerating its efforts toward completion of additionally needed specifications. Current progress of the Airframes Materials and Processes Subdivision headed by L. D. Bonham, Lockheed Aircraft Corp., was reported on pp. 28-29 of the March SAE JOURNAL.

Erle Martin
Chairman, Aircraft-Engine Propeller Subdivision

Engine Standards Accelerated

Val Cronstedt, newly appointed chairman of the Aircraft Engine Subdivision, swung that group into further action at a meeting held in Washington, D. C., on March 15. Moving forward on the basis of marked accomplishments starting back several years ago, this group approved 20 specific subjects for immediate standardization attention. Subcommittees were set up to start immediately on each of these subjects and a chairman was designated for each of the subcommittees. The items decided upon and the chairman in charge of each subcommittee are:

Carburetor Installations: F. W. Wiegand, Wright Aeronautical Corp. *Drives for Engine Accessories,* including tachometer drives on engines (but excepting magnetos and carburetors): G. N. Cole, Pratt & Whitney Aircraft Division, United Aircraft Corp. *Magneto Mountings, Magneto Drives, Magneto Installations, and Distributors:* E. K. Von Mertens, Pratt & Whitney Aircraft Division, United Aircraft Corp. *Spark Plugs, Radio Shielding, and Ignition Cable:* A. L. Beall, Wright Aeronautical Corp. *Plain and Bevel Washers, Taper Pins, Standard Parts, Accessories Cover Plates and Rubber Hose:* G. N. Cole, Pratt & Whitney Aircraft Division, United Aircraft Corp. *Aircraft Screw Threads:* G. Carvelli, Wright Aeronautical Corp. *Involute Splines:* G. Carvelli, Wright Aeronautical Corp. *Drafting Room Practices:* J. G. Perrin, Pratt & Whitney Aircraft Division, United Aircraft Corp. *Preservation of Engines* (in storage): A. P. Ayers, Pratt & Whitney Aircraft Division, United Aircraft Corp. *Surface Finishes:* W. R. Griswold, Packard Motor Car Co. *Engine Performance Presentation:* E. Pierce, Wright Aeronautical Corp.

William Littlewood
Chairman, Aircraft Accessories and Equipment Subdivision

11 Accessory Subjects Approved

Active work on accessories and equipment standardization was begun when the subdivision headed by William Littlewood, American Airlines, met in Dayton on March 7. Following extensive discussion, 11 subjects for immediate study were decided upon.

Subcommittee chairmen appointed to handle the work in each of these fields are: *Pumps:* David Gregg, Eclipse Aviation, Division Bendix Aviation Corp. *Electrical Equipment:* C. C. Shangraw, Eclipse Aviation, Division Bendix Aviation Corp. *Instrumentation:* L. N. Swisher, Sperry Gyroscope Co. *Radio and Ignition Shielding:* H. M. Hucke, Radio Corp. of America. *Air Conditioning and Cabin Supercharging:* W. W. Davies, United Airlines Transport Corp. *Valves and Fittings:* J. M. Roth, Pump Engineering Service Corp. *Wheels, Tires, Brakes, and Axles:* H. F. Schippel, B. F. Goodrich Co. *Hydraulic Equipment:* Harold Adams, Douglas Aircraft Co., Inc. *Heat Transfer Units:* J. J. Hilt, Young Radiator Co. *Ice Prevention and Elimination:* R. L. McBrien, United Air Lines Transport Corp. *Pyrotechnics:* S. G. Wiley, N. J. Fulgent Co.

All of the work of this division, it was agreed, will be concentrated on military requirements for national defense, although it was the opinion of the group members that a majority of requirements in this field for both military and commercial aircraft will be met by a single standard.

Subcommittees were set up to deal with each of the 11 pressing subjects approved for study and emphasis was laid upon the importance of maintaining cooperative contacts with the Aeronautical Chamber of Commerce, military standards authorities, the National Aircraft Standards Committee and the Civil Aeronautics Administration.

Prompt action by all subcommittees of this subdivision was stipulated.

9-Project Propeller Program

The Propeller Subdivision, under the chairmanship of Erle Martin, Hamilton Standard Propellers, Division United Aircraft Corp., had its organization meeting in Washington on March 13 and agreed to immediate work on a nine-project program which would cover cuff clearance, clearance for governors, test club standards, de-icer connections, dual rotation shafts, revision of present standards, retaining nuts, control of two-speed gears and static balance test procedure. One subcommittee member was assigned specific responsibility for each of these projects and active work already is under way.

The full committee personnel of the four subdivisions of the Aeronautics Division of the SAE Standards Committee is as follows:

Aircraft-Engine Subdivision – *Val Cronstedt, Pratt & Whitney Aircraft Division, United Aircraft Corp., chairman;* R. W. Young, Wright Aeronautical Corp.; vice-chairman, A. T. Gregory, Ranger Aircraft Engines, Division Fairchild Engine & Airplane Corp.; W. R. Griswold, Packard Motor Car Co.; R. M. Hazen, Allison Division, General Motors Corp.; S. K. Hoffman, Aviation Mfg. Corp., Lycoming Division; Robert Insley, Menasco Mfg. Co.; J. W. Kinnucan, Continental Motors Corp., and Continental Aviation & Engineering Corp.; L. A. Majneri, Warner Aircraft Corp.; Chester E. Mines, Jacobs Aircraft Engine Co.; N. N. Tilley, Lawrance Engineering & Research Corp.

Aircraft Accessories and Equipment Subdivision – *William Littlewood, American Airlines, Inc., New York Municipal Airport, chairman;* G. W. Brady, Curtiss Propeller Division, Curtiss-Wright Corp.; M. E. Chandler, Chandler-Evans Corp.; David Gregg, Eclipse Aviation, Division Bendix Aviation Corp.; Charles Hollerith, Hayes Industries, Inc.; H. M. Hucke, RCA Mfg. Co.; W. C. Lawrence, American Airlines, Inc., New York Municipal Airport; C. V. Johnson, Bendix Products, Division Bendix Aviation Corp.; Paul Kollsman, Kollsman Instrument Division, Square D Co.; Erle Martin, Hamilton Standard Propellers, Division United Aircraft Corp.; J. M. Roth, Pump Engineering Service Corp.; H. F. Schippel, B. F. Goodrich Co.; T. R. Thoren, Thompson Products, Inc.; Jack Vitol, Aircraft Airworthiness Section, Civil Aeronautics Administration; J. F. Wallace, Cleveland Pneumatic Tool Co.

Aircraft-Engine Propeller Subdivision – *Erle Martin, Hamilton Standard Propellers, Division United Aircraft Corp., chairman;* G. W. Brady, Curtiss Propeller Division, Curtiss-Wright Corp.; C. S. MacNeil, Aero-Products Division, General Motors Corp.; F. E. Weick, Engineering & Research Corp.

Aircraft Materials and Processes Coordinating Subdivision – *J. B. Johnson, Materiel Division, U. S. Army Air Corps, chairman;* B. Clements, Wright Aeronautical Corp.; L. D. Bonham, Lockheed Aircraft Corp.

Aircraft-Engine Materials and Processes Committee – *B. Clements, Wright Aeronautical Corp., chairman;* L. D. Bonham, Lockheed Aircraft Corp.; C. E. Carrigan, Ranger Aircraft Engines, Division Fairchild Engine & Airplane Corp.; P. V. Faragher, Aluminum Co. of America; F. P. Gilligan, Henry Souther Engineering Co.; W. H. Graves, Packard Motor Car Co.; A. W. F. Green, Pratt & Whitney Aircraft Division, United Aircraft Corp.; R. L. Heath, Allison Division, General Motors Corp.; J. N. Huff, Curtiss Propeller Division, Curtiss-Wright Corp.; J. B. Johnson, Materiel Division, U. S. Army Air Corps; F. S. Klock, Hamilton Standard Propellers, Division United Aircraft Corp.; R. R. Moore, Naval Aircraft Factory, United States Navy Yard, Philadelphia; H. J. Noble, Jacobs Aircraft Engine Co.; R. D. Zonge, Aviation Mfg. Corp., Lycoming Division; J. E. Sullivan, Bureau of Aeronautics, U. S. Navy.

Airframes Materials and Processes Committee – *L. D. Bonham, Lockheed Aircraft Corp., chairman;* B. Clements, Wright Aeronautical Corp.; E. P. Dean, Boeing Airplane Co.; Eric Dudley, Curtiss Aeroplane Division, Curtiss-Wright Corp.; Charles J. Gallant, Jr., North American Aviation, Inc.; R. B. Gray, Glenn L. Martin Co.; J. B. Johnson, Materiel Division, U. S. Army Air Corps; Roy Miller, Consolidated Aircraft Corp.; Scott Rethorst, Vultee Aircraft, Inc.; W. L. Sutton, Fleetwings, Inc.; R. A. Webster, Douglas Aircraft Co., Inc.; J. E. Sullivan, Bureau of Aeronautics, U. S. Navy.

New Auto Radio Standards

The Radio Manufacturers Association, with which the SAE is cooperating on a project for reduction of radio interference, recently announced the adoption of a new group of standards for automotive radio equipment.

SAE Club Visits School

"Aviation and Up-to-Date Aviation Equipment" was the topic of Paul Briggs, president of the Aviation Institute of Denver, on Feb. 18 when the Institute was host to some 50 members of the SAE Club of Denver. Following Mr. Briggs' talk, members of the Club were conducted through the Institute's class rooms and shops where students were engaged in sheet-metal, engine, and welding work.

Section Sponsors Course On Vibration Problems

▪ Cleveland

Choosing "Vibration Problems in Engineering" as the topic for their 1941 educational program, the Cleveland Section has launched a series of five lectures on the subject under the direction of Prof. W. M. Dudley, associate professor at the Case School of Applied Science. Three lectures were held in March and the final two are scheduled for April 14 and 21.

The course is free to SAE members—while a charge of five dollars is made for non-members.

Lists Pros and Cons of Different Type Plastics

▪ St. Louis

Commenting on the advantages and disadvantages of the various types of plastics, and the range of usefulness of each, William H. Face, division sales manager, Plastics Division, Monsanto Chemical Co., addressed the St. Louis Section, Feb. 25. Following his presentation, Mr. Face had shown a sound motion picture on plastics. A. L. Heintze, chairman of the Section, introduced the speaker.

Students Hear Higgins On 4-Wheel-Drive Trucks

▪ U. of Wisconsin

The effectiveness of 4-wheel-drive trucks in overcoming rough terrain and mountainous grades, and in highway construction, maintenance and snow removal work, was stressed by F. M. Higgins, Four Wheel Drive Auto Co., in his talk before members of the SAE Student Branch at the University of Wisconsin, March 6.

With cab-over-engine trucks, he said, more weight is placed on the front wheels, increasing the effectiveness of the 4-wheel-drive. He explained that trucks are built with a compensating differential which distributes the power between the front and rear wheels in proportion to the weight carried by the wheels.

Mr. Higgins stated that although automatic locking differentials have been used, he believes that the manually operated type is more practical at the present time. Hydraulic couplings have been used on 4-wheel-drive trucks and have been found to be very satisfactory for load-carrying vehicles, he said, adding, however, that they do not operate as well for snow-removal work. He told the students that there is room for improvement in truck transmissions and power-steering systems.

Uses Tin Cans, Hammers, To Depict Design Changes

▪ Oregon State

Changes in 1941 automobiles were vividly pictured by Wallace Linville to members of the SAE Student Branch at the University of Oregon and their guests, student members of the American Institute of Agricultural Engineers. Mr. Linville, General Petroleum Corp. engineer, clarified his explanations by using tin cans, rubber balls and tack hammers in picturing cylinder size, valve arrangement, and piston speed. With crayon line charts and drawings, he explained Buick's carburetor system, Chevrolet's point polarity reversal switch, and many other developments.

Aided by a small cardboard box, he described the welded box-section frame now used by Ford. He also used the box to demonstrate why the riveted X-section is no longer needed in this construction.

Student Branch Chairman Harry Fall presided at the meeting, which was held Feb. 27.

Students View Pictures Of Indianapolis Race

■ **M.I.T.**

Spring activity at the Massachusetts Institute of Technology Student Branch began Feb. 26, when a number of members and guests witnessed moving pictures of the 500-mile Indianapolis race. This meeting marked the first club activity at the new Sloan Automotive Laboratories. Once-a-month showing of similar pictures is anticipated as a part of the Spring program. Other scheduled events include a visit to the Old Car Museum at Princeton, Mass., a tour through a steam car plant, an inspection trip to the East Boston Airport, and a visit to the local Ford plant.

Ice, Not Speed, Blamed For Turnpike Accidents

■ ***Philadelphia***

Recent accidents on the Pennsylvania Turnpike have not been due to high speed, per se, but have been caused by ice, Charles M. Noble, special highway engineer, Pennsylvania Turnpike Commission, told members of the Philadelphia Section, Feb. 12, in discussion following presentation of his paper stressing the economic advantages super highways offer the truck and bus industry. Many of Mr. Noble's remarks were substantially the same as those presented in his paper, "Toll Roads and Truck and Bus Operation," read at the 1941 SAE Annual Meeting and reported on page 44 of the February Journal.

The chief economy at present, he told his listeners, is the reduction of operating expenses. Two hundred miles less from Indianapolis to New York and 146 miles less from Chicago via the Turnpike as compared to via U. S. 20, are typical of the mileage saving reported by Mr. Noble. In money this represents from $17 to $21, depending on size of truck, he said. The high average speed attainable on express roads decreases labor costs per trip and increases the use factor of equipment, he argued. Further, he commented, the elimination of all traffic stops and the high ratio of average speed to maximum speed decreases fuel and oil consumption and tire and brake wear.

At the close of Mr. Noble's talk, Meeting Chairman J. P. Stewart called on John G. Moxey, transportation engineer, as first discusser. Decrying the magnitude of fuel-tax diversion, Mr. Moxey declared that the $860,000,000 called for in the super-highway construction program outlined by Mr. Noble could be paid for in 20 months by funds which are now diverted from the "gas-tax." Mr. Moxey also outlined some design modifications that have been made to improve vehicle operation over express roads. The trend, he said, is toward more power, lighter reciprocating parts, less reduction in rear ends, and greater ratio of payload to gross weight (up 58% with tank trucks).

Need for express highways was emphasized by Howard A. Flogaus, J. G. Brill Co., and he declared that they must be built despite the high initial cost. He went on to state that permissible size restrictions of buses should be raised for passenger comfort, advocating widths up to 102 in. (6 in. greater than the present maximum), and lengths up to 80 ft, as compared to the existing 35-ft limit.

Increased danger and inconvenience resulting from mixed traffic on narrow public roads were stressed by Henry L. Brownback, consulting engineer. Public dissatisfaction due to under-powered and unsafe trucks and buses, he declared, tends to react to the detriment of the whole motor-transportation industry.

Answering questions by other discussers, Mr. Noble reported that commercial traffic during the winter months has accounted for 55% of the Pennsylvania Turnpike's toll revenue, and that most engine failures have been caused by thin, diluted oil and to dirty cooling systems getting an unaccustomed heavy workout at high speeds.

Last War Started New Era in Spring Making

■ ***So. New England***

Increased industrial tempo following the first World War brought a re-awakening to the spring industry, according to C. J. Bechstedt, chief inspector of the Wallace Barnes Co., Division of the Associated Spring Corp., who was speaker at the Southern New England Section meeting, Feb. 6.

Spring making, he stated, was then an old profession, but it had been conducted pretty much on the "rule-of-thumb" basis. General speeding up of industry after the War, he added, called for improvements everywhere . . . for elimination of breakdowns, greater endurance, and uniformity of quality. Spring makers were quick to realize this and developed a program for scientific research that started the industry on an era of remarkable progress, he declared.

Mr. Bechstedt did not linger on history, but devoted most of his paper to a discussion of the aspects of modern spring manufacture which are particularly interesitng from the engineers' standpoint.

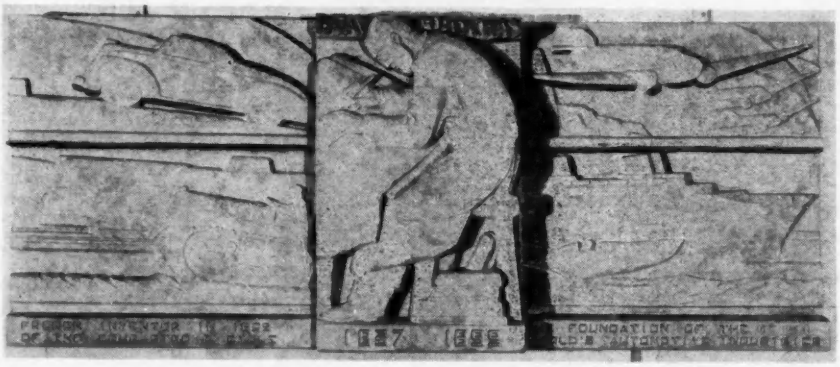
The fundamentals of spring design, he pointed out, are so generally well known that the consumer is the one who does the bulk of original spring designing and specifying. He suggested, however, that the spring manufacturer be asked for advice and recommendations when requirements are extraordinary.

One of the most important factors to consider in spring designing, he said, is the effect of variations from given dimensions on the function of the spring and the relation of variations to tolerances. It is well to remember, he pointed out, that, within the elastic limit, the load characteristics of any spring depend entirely upon the physical dimensions and are not affected nor controlled in any way by the temper or heat treatment. This he illustrated with several examples.

Through the introduction of improved machinery and more uniform materials, the average present-day production spring is made with nearly 50% less variation as compared with the average product of 15 or 20 years ago, Mr. Bechstedt reported, adding, "nevertheless, it is essential when designing springs to carefully analyze the tolerance set up. Be as liberal as possible, especially where cost is a factor. . . ."

Mr. Bechstedt commented that the spring manufacturer, in recent years, has been confronted with quite a list of new materials, among them: chrome vanadium SAE 6150, silicon manganese SAE 9260, several stainless steels, Inconel, beryllium-copper, K-Monel,

Beau de Rochas Plaque Unveiled



A DISTINGUISHED group of French and American engineers gathered Feb. 26 in the Prime-Mover Room of the Franklin Institute in Philadelphia to participate in the dedication and unveiling of a plaque in honor of Alphonse Beau de Rochas (1837-1892) who, in 1862, invented and patented the 4-stroke cycle.

The plaque, a replica of the original bas-relief presented to the Institut Des Arts et Metiers in Paris by La Societe des Ingenieurs de l'Automobile, is a gift of the SIA to the American people through the Society of Automotive Engineers. It came to America in 1939 and was placed on exhibit in the French Building at the New York World's Fair. The unveiling ceremony at the World's Fair was a part of the SAE World Automotive Engineering Congress program.

Arrangements for placing the Beau de Rochas plaque in the Franklin Institute were made by Henry Lowe Brownback, a member of the Council of the SIA and a member of the SAE. Mr. Brownback opened the dedication ceremony at the Institute as representative of the SIA Council. SAE Past President B. B. Bachman presented the plaque to the Franklin Institute on behalf of the Society and unveiled it in its new location. Acceptance by the Franklin Institute was voiced by its director, Dr. Henry Butler Allen.

The French Consul in Philadelphia, Patrick Coppinger, representing Henri Haye, French Ambassador to the United States, presented to the Institute a brochure prepared for the World's Fair ceremony in 1939. A photostatic copy of the original Beau de Rochas patent was presented for the Institute's archives by Mr. Brownback on behalf of the SIA.

and Z-Nickel. While there is an increasing demand for springs made of alloy steels and corrosion-resisting metals, most springs are made of the well-known carbon-steel materials, such as oil-tempered wire, hard-drawn premier and bessemer wires, music wire, annealed spring wire SAE 1085, 0.70-0.80 and 0.90-1.00 carbon flat strip steel, and spring-temper phosphor bronze and brass in wire and strip, he explained.

Using a number of slides, Mr. Bechstedt concluded his paper with a general description of the newer equipment used in the manufacture of springs.

Discusses Factors In Selection of Lubricants

▪ Oregon

The necessity of specifying correct lubricants – drawing correct conclusions in a field complicated by many differences of opinion – is making the handling of petroleum products a profession, not a job, Wallace Linville, engineer for General Petroleum Corp., told members attending the Oregon Section's Feb. 19 dinner meeting.

Outlining the lubrication requirements of modern automobile units, Mr. Linville explained the characteristics of the different lubricants that make them best for particular jobs. A hypoid lubricant, he said, is in reality a straight petroleum product carrying an anti-weld compound. Its ability to protect a hypoid gear is not directly due to its high film strength, but to its anti-welding properties. He likened soap in conventional grease to a sponge for applying the oil and giving it definite characteristics to meet definite needs. The operating requirements of wheel bearings, water pumps, spring shackles and universal joints were covered by Mr. Linville, who told why specific greases are suggested to meet them.

Oil for lubricating engines – gasoline and diesel – make up the most interesting phase of the business, he said, and commented on the conflicts of opinion that make it difficult for the operator to know which oil to choose. In this field he predicts that the future will bring many more additives, with base oil stock selected to meet the operating needs of individual design.

Following Mr. Linville's paper and its discussion, there was a showing of colored motion pictures taken by H. W. Roberts, Roberts Motor Co., while on a trip to South America and Cuba.

Cabin Supercharging Student Meeting Topic

▪ U. of Wisconsin

"Transport Aircraft Cabins for Substratosphere Flight" was the topic that brought record attendance at the recent University of Wisconsin Student Branch meeting. Papers by Walter Forster, equipment engineer, St. Louis Airplane Division, Curtiss-Wright Corp., and David Gregg, chief research engineer, Eclipse Aviation Division, Bendix Aviation Corp., were read by Student Branch Members Ben Rowe and Frank Roberts, respectively, in absence of the authors who were unable to be present. Mr. Forster's paper was earlier presented at the 1940 SAE National Aeronautic Meeting, and Mr. Gregg's at a Southern California Section meeting.

Predominant factors affecting an aircraft passenger's comfort are flying characteristics, ground operation, vibration, sound level, temperature and ventilation, odors, pressurization for high-altitude flying, interior equipment, illumination and color schemes, according to Mr. Forster's paper, "Passenger Comfort in a Modern Air Transport," read by Mr. Rowe. Flying characteristics, it was stated, must be such that passengers will not be uncomfortable during the flight, and this is accomplished with higher wing loading made possible by the use of wing flaps. Since sleeper planes may land and take off several times while passengers are sleeping, the author pointed out, the landing gear must be constructed to provide smooth landing and taxiing. Most vibration can be traced to the engine and propeller, he stated, explaining that it can be reduced by "dynamic suspension," the use of larger engines of the 14- and 18-cyl type, and controllable-pitch propellers.

Pressurization becomes an important problem in substratosphere transportation, said Mr. Forster. With pressurization, he explained, it is possible to maintain an inside pressure that is safe and comfortable to the passengers. Also, he added, with supercharged cabins the rate of descent may be increased over the normal rate without discomfort to the passengers.

"Cabin Superchargers," Mr. Gregg's paper which was read by Mr. Roberts, listed as the basic considerations in cabin supercharging: volume of air, pressure in the cabin, maximum outside altitude, the type of control system and, in particular, the manner in which the cabin supercharger itself performs should be specified.

It is generally accepted, he said, that fresh air requirements in the cabin are 10 cu ft per min per passenger, and that a cabin pressure equivalent to 10,000 ft altitude seems to be acceptable. The cabin pressure may be raised to the equivalent of 15,000 ft in an emergency, he said.

Control of cabin conditions, Mr. Gregg stated, should depend upon: (1) the comfort and health of the passengers and, (2) the simplest mechanism that will meet these requirements. There is need, he said, for complete and wholehearted cooperation between the people who design and build cabin-supercharging equipment and the aircraft manufacturers.

At the business session, Student Branch Member J. G. Rogers was elected to serve the next three semesters as SAE representative on the Polygon Board, the University of Wisconsin committee which sponsors technical meetings and social events which are of interest to the engineering college as a whole.

About SAE Members

(Concluded from page 24)

L. B. GILBERT has been named Chicago regional manager by the White Motor Co. In this capacity he directs branch operations at Chicago, Minneapolis and Milwaukee. Mr. Gilbert has been with the White company for many years, advancing to managership of the Chicago district before his recent appointment. He is vice chairman of the SAE Chicago Section.

HERBERT C. SNOW is chief engineer of the Checker Cab Mfg. Corp., Kalamazoo, Mich. He formerly was consulting engineer with the Columbia Axle Co., Cleveland.

EUGENE ROTH has been called to active duty and is first lieutenant in the 107th Ordnance Co., 32nd Division, Camp Livingston, La. He formerly was assistant engineer with the Sunbeam Electric Mfg. Co., Evansville, Ind.

GARD D. GROCE, formerly with the Cleveland Tractor Co. as merchandising service manager in charge of service and parts, is general service manager with the Buda Engine Co., Harvey, Ill.

Early last month, **HENRY FORD** told newspapermen that a "flivver" plane, which will be able to take off from a small plot and which will sell for the price of a light car, may be produced by the Ford Motor Co. at some future date. "We've been experimenting with a two-seater that we expect to put on the market ultimately," he said. "It will probably combine features of the ordinary airplane and the 'gyro-type' ship, permitting it to land or take off in a small area." He also mentioned that the airplane will probably be powered by a 300-hp engine, built horizontally into the wing, and that the body will be made of plastics.

CHARLES F. STEIN has been named vice president of the Quaker Stretcher Co., Kenosha, Wis. He previously was affiliated with SKF Industries, Inc.

A. Y. DODGE, development engineer, research department, Borg-Warner Corp., has been transferred to the Rockford Drilling Machine Division, Plant No. 1, Borg-Warner Corp., Rockford, Ill.

R. M. FARIS, formerly research engineer, Petroleum Conversion Corp., Elizabeth, N. J., is research engineer with Ranger Aircraft Engines, division of Fairchild Engine & Airplane Corp., Farmingdale, Long Island.

E. W. KISBY, formerly sales and service engineer, American Brakeblok Division, American Brake Shoe & Foundry Co., New York, is now affiliated with the Thermoid Co., Trenton, N. J.

FRED H. SCHELL has been transferred by the Black & Decker Mfg. Co., from Towson, Md., to Pittsburgh, Pa.

DANIEL K. COYLE, who was chief engineer, Diesel Western Co., Los Angeles, is now industrial engineer with the Vega Airplane Co., Burbank, Calif.

W. K. FENTRESS, JR., is mechanical engineer in the engineering research department of The Texas Co. at Beacon, N. Y. He formerly was a student engineer with the Virginia Electric & Power Co., Norfolk.

HERBERT H. SCHULDT, formerly dynamometer operator, research laboratory, White Motor Co., Cleveland, has joined the Schwitzer-Cummins Co., Indianapolis, as junior engineer.

HARLOW A. TRIPLETT, formerly a member of the SAE Student Branch at Purdue University, is test engineer with the Electro-Motive Corp., La Grange, Ill.

H. W. SHONNARD is manager, shell division, Goslin-Birmingham Manufacturing Co., Inc., Birmingham, Ala.

The National Association of Manufacturers, in an effort to coordinate and speed defense production on a regional basis, has announced a series of "defense clinics" to be held in 36 states during the next six months. Among SAE members expected to participate in some of these meetings are **WILLIAM S. KNUDSEN,** director of the Office of Production Management, and **WILLIAM L. BATT,** deputy director of the OPM production division.